THE IRON TRADE REVIEW

VOLUME XXIV. CLEVELAND, O., JULY 23, 1891. NUMBER 30.

THE IRON TRADE REVIEW.

A JOURNAL OF THE
IRON AND STEEL INDUSTRY, THE MACHINERY TRADE AND KINDRED INTERESTS
IS PUBLISHED EVERY THURSDAY BY
THE IRON TRADE REVIEW CO.,
27, 29 *and* 31 *Vincent Street, Cleveland, Ohio.*

TERMS, (strictly in advance):

One year	$3 00
Six months	1 50
Three months	75

Advertising Rates Furnished on Application.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER.

CLEVELAND, O., JULY 23, 1891.

THE WEEK IN IRON CIRCLES.

General Features. The improvement in the general situation that was expected by many to begin by midsummer, has not taken any shape yet. All the conditions are steadily improving, and special obstacles, like gold exports, fear of financial unsoundness, etc., are disappearing. Yet the markets do not respond. The railroads still hold back, and act with the utmost conservatism in all their operations. There is, however, a widespread feeling of confidence in the soundness of things, and a belief that all will go better when the money for the big crop begins to get into the channels of trade. The midsummer statement of the blast furnaces shows a somewhat remarkable condition of things. More pig iron was being made July 1st than at any previous date in 1891. The total capacity of active furnaces July 1, 1891, was 167,424 gross tons. The capacity in blast January 1, 1891, the largest at any previous date, was 164,281 gross tons. The total production of pig iron in the United States during the first six months of 1891 was 3,776,556 tons, or 1,331,319 tons less than the first six months of 1890. At Cincinnati there were few transactions to give any special character to the past week. One large Ohio agricultural works has placed orders for its season's requirements. A malleable concern has contracted for about 10,000 tons Lake Superior charcoal iron. Rolling mills and car works have placed a few moderate orders. Otherwise dullness has pervaded everything. The failure of a large car works having plants in Ohio and Indiana hardly caused a ripple, as it had been doing but little work and purchased very little material this year. The usual midsummer quiet characterizes the Chicago market. Carload orders are numerous, but few contracts of any size are being made. Prices on Northern and Southern iron, both coke and charcoal, remain unchanged. It is now conceded that the low-priced sellers of Lake Superior charcoal have nearly, if not quite all, withdrawn. The outlook for the remainder of the year is generally healthy; the large crops which are now nearly assured are certain to result in giving a general impetus to business, starting first with the railroad lines and then extending to all branches. Buying, on the part of railroads, however, has not yet begun. In a general way, the transactions in pig metal at Detroit, are confined to carloads and small lot orders, and were it not for a few rather large transactions in Lake Superior charcoal, the market would be entirely featureless. Some inquiry which came in during the week prior to the one under review, developed into considerable actual transactions; the malleable ironmakers' business must be very large, as these deals were chiefly confined to them, and some of the buyers were those who contracted early in the season for all they presumably would require, but find themselves in need of further quantities with the season not yet half gone by. It is natural then to expect others to be in much the same condition, and it is hoped and believed by the furnacemen that the most sanguine estimaters for large tonnage will only err in placing the amount too low. The car and carwheel makers are getting more busy every week, and with the developments of wants on the part of railway companies when the crops commence moving, a continued good business should be seen during the balance of the year. The character of the buying at Louisville is largely car load lots; consumers reporting demand for finished material as not being up to their expectations, and that it is difficult where sales have been made, to secure prompt settlement. This has led to unusual conservatism in placing orders, and the quantity of iron placed is very small. Prices are being made that are regarded by all as extremely low, but, notwithstanding the assurance of heavy crops with fair prices for same, buyers of raw material are not willing to purchase largely for the future. This is specially true of car wheel irons that are offered in many instances largely below cost for special reasons, and yet buyers are afraid to purchase heavily, though they realize that any change may cause same to advance sharply, and that it cannot be expected that charcoal irons for any length of time can be bought as at present, below cost. It is thought that this inactivity must change shortly to free buying as crops are largely assured. From Buffalo comes the report that there has been quite a satisfactory amount of buying during the week. Agricultural implement manufacturers, nearly without exception, report business good; their works in many cases have been kept running, by press of business, much longer than anticipated. Jobbing foundries show more activity and are purchasing more freely. As the tendency now, however, is toward overproduction, prices do not advance. An extended trip through the Alabama iron district reveals some increase of stocks, owing mainly to holding back of deliveries on large rolling mill and other contracts. It is estimated that the forward sales of all the Alabama furnaces will reach close to 200,000 tons, while the total of stocks on hand is probably 35,000 tons. Woodward, Alice and Thomas have each put one furnace out for repairs, and no stacks have gone in in their place. One encouraging and highly important feature to the Birmingham district is that the leading companies having mortgage debts, are earning interest on bonds and all fixed charges from their coal and coke business alone, leaving the furnaces free from that special load.

The Local Situation. As matters now stand, the conditions are such that the producers of ore are not desirous of selling any more at the old prices, or even at a slight advance, while consumers are not ready to take any more ore at a considerable advance, so that the business may be said to be at a standstill. Lake freights have advanced rather more quickly than was anticipated by the shippers in the fore part of the season, and they are consequently losers by reason of the low prices they made on their earlier sales, which were made with the expectation of steadier lake freights. In the meantime the merry war between the iron ore and coal shippers on the one side and the grain forwarders on the other, has broken out afresh and will have a serious effect on the market within the near future. Escanaba freights are very firm at 80 cents, and $1.00 has been paid for Marquette freights, the Ashland rate remaining at the same figure. Up to now, a great many boats, despite the delays involved have taken coal up to bring down ore, but during the past week there has developed a feeling in favor of going up light to bring down ore at the higher rate, so that the coal freights are also on the advance. Quite naturally boats prefer to go to Marquette when coal freights are low, but the present emergency will take a great deal of tonnage to the head of the lakes for grain, and the rush in that direction may play havoc with the later iron ore sales. The strike at the mills of the Pennsylvania Steel Company at Steelton, has attracted a great deal of attention and may have a bearing upon local affairs. Four thousand men are on strike at the Steelton works to enforce recognition of the scale. It must be remembered that the Steelton mills work on the Eastern scale which specifies $3.75 a ton for puddling, which is $5.50 hereabouts, but the employers will not recognize the Amalgamated Association. If the strike is likely to spread, the present time seems to be the most opportune for the mill men, as this is the season for the annual repairs and there is a sufficiency of stocks to carry them through the next three or four months. Pig iron is dull both as to sales and prices, and there is no perceptible movement.

"OF COURSE."

At last we have the secret of the (*Un*)-*American Artisan's* remarkable attitude in opposition to the American tinplate industry and the duty which makes possible the existence of such an industry. Singularly enough, the evidence comes from London, and the authority is from no less influential source than our able Free Trade contemporary, the *Iron and Steel Trades Journal*. Probably the London journal had no idea of "giving away" its American ally, but it could not have done so more neatly or completely had it lain awake nights, with malice aforethought, to spike the *Artisan's* guns. In calling attention to the fact that the *Artisan* had recently published a portrait of Mr. Daniel Edwards, of the Dyffryn Tin Plate Works, near Swansea, and a "bird's eye" view of those works, the *Iron and Steel Trades Journal* says: "Our Chicago contemporary is almost the "only trade paper in America whose editor has taken a bold stand "against the tinplate clause in the American tariff bill." We would say so! The position of the *Artisan* among American trade papers, even in its own line, is unique, solitary and conspicuously absurd. It is certainly welcome to the notoriety into which its vagaries have thrust it. But the *Journal* goes on to show how it comes that the able Chicago editor has taken such a liking to foreign industries. "Mr. Daniel Stern," it says, "is a frequent visitor to Europe (ah!), "and the appreciation of his efforts is shown *by the large number of "advertisements from the Welsh works appearing in his paper*." So! "Mr. Edwards," pursues the London journal, with relentless cruelty, "of course, is a supporter of the *Artisan*, and Messrs. William Wil-"liams & Co., the Morriston Tin Plate Company, the Grovesend, "Birchgrove, Cwmfelin, Old Castle and Fairwood, Clayton and Dyne-"vor Companies, R. Thomas & Co., of Lydney, and W. Lewis & "Son, of Gorseinon, all advertise largely in the *American Artisan*."

"Mr. Edwards, of course, is a supporter of the *Artisan*." Why, "of course?" Why not, if not because the *Artisan* is the invariable friend and champion of the Welsh tinplate monopolists? Why do the other extensive tinplate works in Wales advertise largely in the *Artisan*? "Of course," they could not do otherwise in view of the disinterested services rendered by that paper in their behalf.

"The paper," says the London paper, in conclusion, meaning the *Artisan*, "is condemned by rival journals for opposing the tariff; "but the advertising business from South Wales is doubtless grate-"ful and comforting to the proprietor." No doubt! And would the *Journal* have us think that the vigor and enthusiasm of the *Artisan's* defense of its Welsh patrons is in direct proportion to the size of its advertising bills? It cannot be that the London paper has concealed beneath its charmingly naive treatment of the subject, a vein of rarest sarcasm! The *Artisan* will please accept assurances of our distinguished consideration.

A VERY WIDE AWAKE STATESMAN.

"Whether so designed or not, an effect of the reciprocity clause "of the McKinley Tariff Act will be either to cripple and destroy the "foreign and colonial trade of Great Britain or to accelerate British "federation." So says the wide-awake *Canadian Manufacturer*, and it proceeds to rap the Mother Country on the knuckles for not appreciating the fact that "the very influences that have deprived her of the Brazilian market are working actively to deprive her of other markets, and the probability that numbered among these will be some, perhaps many, over which floats the British flag." As if to "rub it in" more effectually the *Manufacturer* institutes this scathing comparison between Lord Salisbury and Secretary Blaine:

Lord Salisbury may be a remarkably astute statesman, but Mr. Blaine's political vision seems to be exceedingly clear. It is entirely improbable that Great Britain and the United States will ever again clash in hostile warfare, but in the great American Republic the Mother Country has a competitor for commercial supremacy worthy of her steel. Is it absurd to suppose that Mr. Blaine did not have this very matter in view when planning his reciprocity scheme to capture so large a share of the world's commerce, wresting it from Great Britain? He was aware that Imperial Federation was being discussed both in Britain and in all British possessions, and he could readily see that should it be brought about his plans for the capture of so much foreign trade for his country would prove abortive. He could see that Imperial Federation was not as yet very popular in Britain, and that in the colonies there was no unity of action tending to bring it about, and that that was a good time and a fitting occasion to defeat the project. With Imperial Federation Britain would be able to retain all her possessions to herself and still be in most excellent condition to contest with the United States for the trade of other countries that is now slipping away from her. With Imperial Federation, coupled with a tariff system which would give some slight discrimination in favor of the federated possessions, Britain would not lose the proud prestige she has been striving for hundreds of years to attain. If she would retain this prestige, however, she must of necessity abandon her ultra free trade policy. Then Imperial Federation would not be a dream as it now is. With Imperial Federation and a judicious form of tariff protection Britain would be at no disadvantage in competing with the United States for commercial supremacy.

Imperial Federation has a pleasant ring, and after awhile it may jingle musically enough in Lord Salisbury's ears to wake up that astute and sleepy diplomat; but in the meantime Mr. Blaine is rapidly negotiating new treaties, and the World's Fair is coming on apace.

HOW TO ABATE THE SMOKE NUISANCE.

There is an opportunity for the Society for the Promotion of Atmospheric Purity, of Cleveland, to distinguish themselves in abating the smoke nuisance. It seems that it is impossible for any municipal corporation to succeed, whether from political reasons or whether it is from some unknown cause. It is not recorded that any municipal authorities have ever accomplished the work. The cities in Europe have ordinances now in force that were passed 70 years ago. The question has been agitated always by the municipal authorities, and upon each occasion when a move has been inaugurated by the authorities they have commenced in the same place and in the same manner as their predecessors, and all wound up in about the same manner, and the smoke nuisance goes on forever. The principal cities in the United States, where bituminous coal is used for fuel, have ordinances for the suppression of the smoke nuisance. All such ordinances are in the hands of the municipal authorities, who are elected by the people, and those cities remain in the same condition as those in Europe, and the smoke nuisance remains unabated. We would suggest to the Society for the Promotion of Atmospheric Purity that they take the matter up and proceed against the offenders in the same manner that the Humane Society enforces the laws relative to cruelty to animals. This has been done successfully in most of the cities of the United States; and if the laws were enforced and an honest and intelligent effort made to abate the smoke nuisance there is no doubt that it could be accomplished, and that, too, without any hardship to the steam users and to those who are making the nuisance, to bring about the results so much desired. It is only necessary that the furnaces burning bituminous coal should be so constructed that the combustion shall be made complete; and the nearer we go to complete combustion in the furnace the less coal it takes to make steam.

BELGIUM WORKING FOR INDUSTRIAL INDEPENDENCE.

The Glasgow (Scotland) *Engineer* correctly sizes up the situation when it says:

There can be little doubt that the cardinal object of the McKinley Tariff is to secure for America a monopoly in certain fields of manufacture and commerce, and especially, to enable her to become less dependent commercially on other nations than she now is. But, America is not the only nation in the world which is "striving to be free," in the sense spoken of, the "spirit of independence," if the phrase may be permitted, is rapidly spreading over some of the continental countries, notably Belgium. There are indications in various quarters which combine to support us in this observation, and one of the newest "signs of the time," is the statement that there is about to be formed in Brussels a new organization to be known as the Society of Belgian Commerce. The grand aim of this concern, according to the information to hand, will be to alter the present state of things, by which a large proportion of the foreign trade of Belgium is done through the medium of British agencies and the goods extensively carried in British vessels. It is said the new company will establish agencies in foreign markets for the purchase of native and the sale of Belgian products, and will also endeavor to obtain concessions abroad for the construction of railways, gas and water works, sugar refineries, etc., to be executed in Belgium. The capital will be principally taken up among the coal and iron masters, metallurgists, and engineers connected with the Brussels Metal Exchange. Another project is on foot for extending Belgium trade with China by establishing a line of steamers between Antwerp and the Chinese treaty ports.

That Belgium is to be added to the list of protective countries will be no doubt received with very poor grace by English manufacturers. No wonder the *British Manufacturer*, a remarkably outspoken paper, asks what advances the Free Trade theory has made outside of Great Britain since it was inaugurated fifty years ago, and answers its own question by asserting that "while Great Britain has clung to it with great tenacity and perseverance, there is now no other important nation that entertains it."

The Iron Trade Review, **of Cleveland, asserted a few weeks ago that there are tinplate works in this country turning out 60,000 boxes of tinplates a year. —[American Artisan.**

It might do just as well for the *Artisan* to be honest in this matter. *The Iron Trade Review* never editorially asserted anything of the kind. In our miscellaneous columns appeared a clipping from the press dispatches, which perpetrated the error in question. Thereupon we printed a communication from the Secretary of the American

Tinned Plate Manufacturers' Association, correcting the statement, which, on account of its very absurdity, scarcely needed a correction. Of course, the misleading statement would never have been printed had the clipping been examined with care prior to its being sent to the printer.

BASIC slag, which formerly sold in England for 60 cents per ton, now brings ten times as much, viz., $6.08 per ton. Here is a hint to Southern basic steel makers.

THE second half of 1891 will bring prosperity to nearly all lines of manufactures, or many shrewd prophets have lost their reckoning.

PRODUCTION OF ALUMINUM IN THE UNITED STATES.

The Cowles process, now carried on by the Cowles Electric Smelting & Aluminum Co., at Lockport, N. Y., which was the pioneer of electro-metallurgical processes for the reduction of aluminum, was established in 1885. Since that time its production has been as follows: aluminum bronze—1885, 4 000 to 5 000 lbs., valued at $1,600 to $2,000: 1886, 50,000 lbs., valued at $20,000; 1887, 144.764 lbs., valued at $57,000. Ferro-aluminum (containing from 5 per cent. to 10 per cent. aluminum)—1886, 2,000 to 3,000 lbs, valued at from $780 to $1,170; 1887, 42 617 lbs., valued at $16,621. The total aluminum alloys produced by this company in 1889 was 171.759 lbs. The production of aluminum by the Pittsburgh Reduction Co., in 1889, was 19 200 lbs., which was sold at $2 per lb. in quantity. The total production of aluminum in the United States in 1889, including that contained in alloys, was 47.468 lbs., valued at $97.335.

The imports of aluminum into the United States are given in the following table:

Years.[b]	Quantity lbs.	Value.	Years.[b]	Quantity lbs.	Value.
1870		$ 98 00	1880	340.75	$ 4,042.00
1871		341.00	1881	517 10	6 071.00
1872			1882	566.50	6,495 00
1873	[a]2.00	2 00	1883	426 25	5,079.00
1874	[a]183.00	2,125.00	1884	595.00	8,416 00
1875	[a]434.00	1,355 00	1885	439.00	4,736.00
1876	139.00	1,412.00	1886	452.10	5,3 9.00
1877	131 00	1,551 00	1887	1,260.00	12,119 00
1878	251.00	2,978.00	1888	1,348 53	14,086 00
1879	284.44	3,423 00	1839	998.83	6,688.07

(a) Probably alloys. (b) Fiscal years ending June 30 to 1836; calendar years subsequently.

France was the only country which produced aluminum commercially until a few years ago. It had never been seen in any quantity until the Paris exposition of 1855 where it was shown in ingots and in the form of manufactured articles of various kinds Among ornamental articles it was noticed that a small body of the imperial guard wore breastplates of aluminum. The price of the metal was then 2,000 francs a kilo. The production was as follows: 1863, 1 ton; 1867, 1 7 tons; 1872, 1 8 tons. Later statistics give the aluminum product of France as follows: 1886, 2,430 kilos, valued at 243,000 francs; 1887, 2,040 kilos, valued at 204,200 francs; 1888, 2,955 kilos, valued at 295,500 francs. Allowing the French production to have been 1.5 tons a year from 1860 to 1880 and 2 5 tons from that date to 1889, inclusive, we should have 31.5 plus 22.5 equaling 54 tons, or about 60 short tons, in the 30 years.

The production of aluminum in England in 1888 was 5,000 lbs., valued at £5,000; in 1889, 12,000 lbs., valued at £6,000. There was an English manufacture of aluminum from about 1860 to 1874, but no statistics of its production are obtainable. It could not have been very considerable, as the price of the metal was then very high. The Castner process was inaugurated in England in 1888. Supposing 5,000 lbs. per annum to represent the English production from 1883, when the Webster process was put in operation, to 1888, we have 30,000 lbs. which, with the 12,000 lbs. for 1889, equaling 42,000 lbs., or 21 tons, may be regarded as the English production up to the beginning of 1890. The French and English production would therefore amount to about 82 tons. The Aluminum and Magnesium Fabrik, at Hemelingen, near Bremen, has been in operation since the latter part of 1887, and has supplied all the aluminum produced in Germany. The production of this company is given as follows: 1887, 1 700 kilos; 1888, 8 400 kilos; 1889, 9,500 kilos; total, 19 600 kilos.

Adding this total to the figures representing the sum of the French, English and the American production from all sources, exclusive of alloys, which is nearly 94 short tons, we get in round numbers, 116 short tons, which therefore represents the total production of aluminum from 1860 to 1889, inclusive.—[R. L. Packard in Census Bulletin No. 79.

A Revolution in Iron and Steel Making

A new system of working iron under the patents of the late Mr. Stephens, of Birmingham, has been successfully demonstrated at the Crown Point Foundry, Leeds. For this invention it is claimed that the commonest pig-iron can be used with the same results as iron of superior quality, and that iron castings having all the characteristics of steel, with the durability and malleability of finished iron, can be produced direct from the ironfounder's cupola, whilst the maximum production of iron is obtained. The results are secured by the use of a new flux termed "steffanite," a combination of alum and emery, and containing about 70 per cent. of aluminia So clean are the castings produced by this metal that they can be placed at once in the lathe or boring machine, and can be reheated and chilled immediately afterwards. The appearance of the finished metal is that of nickel silver. A public company is being promoted to manufacture the new metal, which promises to revolutionize the iron and steel industries.—[Hardward Trade Journal, Birmingham, Eng.

CONDITION OF THE BLAST FURNACES OF THE UNITED STATES.

July 1, 1891.

[CONDENSED FROM THE AMERICAN MANUFACTURER.]

LOCATION OF FURNACES.	CHARCOAL. Total No. of Stacks.	CHARCOAL. In Blast. No.	CHARCOAL. In Blast. Week'y capacity.	CHARCOAL. Out of Bl'st. No.	CHARCOAL. Out of Bl'st. Week'y capacity.	BITUMINOUS OR COKE. Total No. of Stacks.	BITUMINOUS OR COKE. In Blast. No.	BITUMINOUS OR COKE. In Blast. Week'y capacity.	BITUMINOUS OR COKE. Out of Bl'st. No.	BITUMINOUS OR COKE. Out of Bl'st. Week'y capacity.
New England	13	6	541	7	791					
New York	9	2	231	7	883	6	3	2,807	3	2,074
Pennsylvania	14	6	346	10	774	1	0	0	1	600
Upper Susquehanna Valley										
Pittsburgh						25	23	30,868	2	1,911
Spiegel						1	1	885	0	0
Allegheny Valley						1	1	930	0	0
Shenango Valley						17	15	12,384	2	761
Youghiogheny Valley						4	1	936	3	1,654
Juniata and Conemaugh Valleys						20	11	5,635	9	4,185
Maryland	8	2	198	6	500	3	1	1,528	2	1,487
Virginia	8		34	7	479	14	12	6,788	2	435
North Carolina						1	1	100	0	0
West Virginia	2	0	0	2	130	6	1	1,267	5	2,526
Ohio—Mahoning Valley						15	11	9,227	4	3,280
Eastern, Central and Northern						17	1	9,146	6	4,143
Hocking Valley						14	4	1,314	10	2,668
Hanging Rock	12	7	572	5	540	14	9	1,560	5	1,248
Miscellaneous										
Kentucky	1		104	0	0	5	2	597	3	962
Hanging Rock										
Western Region and Miscellan'ous										
Tennessee	6	3	901	3	462	13	9	4,657	4	1,538
Georgia	4	2	386	2	231	2	1	752	1	675
Alabama	14	6	1,540	8	1,693	38	22	14,462	16	10,272
Indiana						2	1	760	1	278
Illinois						16	10	11,951	6	6,815
Spiegel										
Michigan	23	10	3.195	13	3,920					
Wisconsin	5	3	1,568	2	397	4	3	2,453	1	422
Minnesota						1	0	0	1	140
Missouri	2	1	218	1	315	5	0	0	5	3,764
Texas	3	2	486	1	185					
Oregon	1	1	269	0	0					
Colorado										
Utah										
Washington	1	0	0	1	205	2	1	331	1	350
Total charcoal and coke	126	51	10 589	75	11,305	247	154	120,858	93	52,189
Total anthracite	158	92	35,977	66	22,081					

SUMMARY.

FUEL.	IN BLAST. Number.			IN BLAST. Weekly Capacity.			OUT OF BLAST. Number.		OUT OF BLAST. Weekly Capacity.	
		Month Previous.	Year Previous.		Month Previous.	Year Previous.		Month Previous.		Month Previous.
Charcoal	51	47	62	10,589	11,142	13.234	75	79	11,305	11,251
Anthracite	92	93	114	35,977	37,238	45 038	66	67	22,081	2 ,591
Bituminous	154	127	164	120,853	99 419	120,423	93	120	52,189	84,076
Total	297	267	340	167,424	147,799	178,695	234	261	85,575	116.638

Electric Stop-motion.

In the process of making yarn it often happens that threads break, and unless the machinery is stopped, ugly snarls result, causing a loss both in time and material. Heretofore there have been invented a variety of mechanical stop-motions, but owing to the many points to be guarded and the complex conditions under which they work none have been altogether satisfactory. Recently, however, electricity has come to the aid of the spinner, and an electric stop-motion for spinning machinery, which quickly and automatically covers all the unguarded places in the machinery, is the result. The two rolls between which the yarn passes are each connected with a pole of a battery. When the yarn breaks the rolls immediately come in contact with each other, thus closing the circuit and actuating an electro-magnet, which stops the machinery instantly. In case the yarn, instead of passing on, becomes wrapped around the rolls, the increased thickness of the material forces the upper roll against a pin also connected with the battery, and the machinery is stopped as before. The certainty and rapidity of the action of the electricity is said to be greater than by the mechanical contrivances, and the result is that a machine can be driven at a higher rate of speed than is possible under the old system, and with less ability to waste.—[Philadelphia Record.

New Nail Machine.

The ordinary wire nail machine bids fair to be superseded, if the success of the Pittsburg Iron & Nail Co. in fitting a wire nail attachment to its steel-plate nail mill shall prove of general adaptation. In carrying out this plan, the self-feeder of a nail plate machine is removed, its place being substituted with an ordinary wire nail machine feed, operating from the left side; the bed plate, gripping, and heading dies remain as in the old machine, but from the clamp at the back is attached an arrangement for cutting and pointing the wire similar to the manner in which this process is carried on in regular nail wire machines. It is said that the adapted machine turns out perfectly formed nails at the rate of 250 a minute, and that the heading die performs its work better than characterizes the ordinary apparatus; the heading arrangement of the latter works from above, and fashions the head with a quick blow, while the heading die of the transformed nail plate machine works from the right hand side, and works the heads with a more gradual motion. The nails by this method are represented as thoroughly well made, well pointed, and with large head, and without any indication of splitting. By changing the space block, four, six, eight and ten-penny sizes can be made, and the capacity of the device for wire nails is said to be from 40 to 50 per cent. greater than the common wire nail machine.

PRODUCTION OF PIG IRON IN THE FIRST HALF OF 1891.

Advance sheets of the *Bulletin* of the American Iron and Steel Association, just at hand (thanks to the prompt courtesy of Mr. James M. Swank, General Manager) convey important and significant information regarding the status of the iron and steel industry at the end of the first half of 1891. We condense the statement as follows:

The total production of pig iron in the United States in the first half of 1891 was 3,371,925 gross tons, against 4,560,513 gross tons in the first half of 1890, a decrease of 1,188,588 gross tons, or 26 per cent.

The States which increased their production during the first half of 1891, were Massachusetts, Connecticut, Georgia, Texas, Michigan and Colorado. Four of these States produce only charcoal pig iron. The production of Pennsylvania was reduced 636,204 net tons; Ohio, 237,568 tons; Illinois, 149,819 tons; Alabama, 84,330 tons; Missouri, 46 634 tons; New York, 44,611 tons; West Virginia, 42,662 tons; Wisconsin, 31,486 tons; Virginia, 25,144 tons; Maryland, 22,640 tons, New Jersey, 20,504 tons; Kentucky, 6,767 tons; Indiana, 3,988 tons; Oregon, 652 tons; and North Carolina, 398 tons. Tennessee came very near maintaining her record of the first half of last year, producing in the first half of 1891 within 1,483 net tons of her production in the first half of 1890.

Analyzing the aggregate reduction in our production of pig iron in the first half of 1891 we find that the reduction in anthracite and mixed anthracite and coke pig iron was 17.2 per cent.; in unmixed coke and raw bituminous pig iron, 30.8 per cent.; and in charcoal pig iron, 6 per cent. The reduction in Bessemer pig iron was 32.8 per cent.

Our production of spiegeleisen declined in the first half of 1891, in which period we made 49,887 net tons, as compared with 97,907 tons in the first half of 1890.

The production of pig iron in the nine Southern States in the first half of 1891 as compared with the first half of 1890 shows a falling off amounting to 17 5 per cent. The figures are as follows:

States—Net tons.	First half 1890.	First half 1891.
Alabama	463,451	379,121
Tennessee	143,493	142,010
Virginia	167,052	141 908
West Virginia	63,639	20,977
Kentucky	25,546	18,779
Georgia	10,599	24,401
Maryland	72,632	49,992
Texas	5,817	8,465
North Carolina	1,401	1,003
Total	953,630	784,656

The total quantity of unsold pig iron stocks which were in the hands of makers or their agents on June 30 last, and which were not intended for the consumption of the manufacturers, was 495,102 net tons, against 681,992 net tons on December 31 last, a decline of 186,890 net tons. These figures cover the increased production of June in the Shenango and Mahoning Valleys.

In addition to the above stocks of unsold pig iron the American Pig Iron Storage Warrant Co. held in its yards on June 30, 1891, 49,800 gross tons, of which 9,449 tons are included in the above table, leaving 40,351 gross tons, or 45,193 net tons of pig iron on the market in other hands, against 59,289 tons so held on December 31.

On June 30, 1891, there were 295 furnaces in blast, against 311 in blast on December 31, 1890. On June 30, 1890, there were 339 furnaces in blast, or 44 more than on the 30th of June last.

The figures showing our production of pig iron in the first half of 1891 indicate a far greater reaction in this leading branch of our iron and steel industries than has ever before occurred. Even the reaction following the panic of 1873 was relatively not anywhere near so severe as that which has just taken place. In the same year in which the panic occurred our production of pig iron reached its maximum of 2,560,963 gross tons. From that year until the close of 1876 there was a gradual decline in production to 1,868,961 gross tons in the last named year, or 27 per cent. for the whole period from 1873. Now we reduce our production 26 per cent. in six months.

The following table shows the production of Bessemer steel ingots in the first half of 1891 compared with the first half and second half of 1890:

State—Ingots.	First half 1890. Net tons.	Second half 1890. Net tons.	Total 18_0. Net tons	First half 1891. Net tons.
Pennsylvania	1,275,616	1,247,808	2,523,424	1,097,653
Illinois	386,497	462,254	848,751	237,845
Oh'o	204,098	201,267	405,365	160,024
Other States	175,028	178,967	353,995	103,574
Total	2,041,239	2,090,296	4,131,5 5	1,599,096
Clapp-Griffiths only	39,627	37,363	76,990	33,789

The following table shows the production of Bessemer steel rails of all weights and sections, including street rails, in the United States in the first half of 1891 compared with the first half and second half of 1890

States—Rails.	First half 1890 Net tons	Second half 189-. Net tons.	Total 1890. Net tons.	First half 1891. Net tons.
Pennsylvania	738,931	657,529	1 396,460	439,902
Illinois	279,441	328,096	587,537	139,492
Other States	14,286	14,905	29,191	535
Total	1,032,658	980,530	2,013,188	570,920

The shrinkage in the production of Bessemer steel ingots in the first half of 1891 as compared with the first half of 1890 was over 21 per cent. while the shrinkage in the production of Bessemer steel rails in the same period was nearly 44 per cent. These are very good shrinkages. The wide gap between them, however, again illustrates the growing popularity of Bessemer steel in the production of articles other than rails. Our production of Bessemer steel rails in the first half of 1891 was the smallest half-yearly production that has taken place since the first half of 1885 It was even smaller than in the second half of that particularly dull year.

A TINPLATE LEDGER.

The following facts and figures are collated from the result of inquiries made by the *Mail and Express*, of New York. These are to be accepted with the legitimate allowance made to a concensus of various opinions and calculations. It is, however, beyond dispute that opinions are decidedly optimistic, and the arithmetic at the basis of calculations, if subject to qualification and correction, are, nevertheless, an approximation to reasonable renderings. The importation of tinplate into the United States in 12 months ending April 30, in tin and terne plate, amounted to 422,284 net tons, having a declared value of $28,325,395. In the production of this amount of tinplate, the pig iron needed would be, roughly estimated, 550,000 tons. But four States in the Union—Pennsylvania, Ohio, Alabama and Illinois—produced as much pig iron in 1890. This is equal to the average production of 20 modern blast furnaces working an average of 300 days in a year. It has been estimated that it requires, at a furnace, on an average, a day's work of a man to produce a ton of pig iron. It would require, therefore, to produce this amount of pig iron, 550 000 days' work constantly of one man at a furnace, or, say, the work of 1,883 employes, working 300 days in a year.

In the iron ore needed: It requires two tons of iron ore to produce a ton of pig iron and for the fettling necessary in reducing a ton of pig iron to sheet. To produce this 550,000 tons of pig iron that will be consumed in the production of the 422,284 tons of tinplate would require, therefore, 1,100,000 tons of iron ore. This is two and one half times the product of all the iron mines of New Jersey; it is six times the product of the iron mines of Missouri. Taking the census of 1880 as a basis, it would seem that it requires a day's work to produce a ton of ore. Therefore, to produce the amount of ore necessary to make the amount of pig iron that would be used in the manufacture of tinplate referred to would require 1,100,000 days' work of one man, equivalent to the work of 3.366 men working 300 days a year.

In the call on the coke and coal industries, assuming that there is required 1.2 tons of coke to make a ton of pig iron, there would be a demand for 660,000 tons of coke. This is in excess of the production of any State in the Union except Pennsylvania, West Virginia and Alabama. To make this coke would require over a million tons of coal. To mine this coal and make this coke would require at least 600,000 days' labor of one man, or the labor of 2,000 men 300 days in the year.

In addition to this there would be required for fuel in the sheet and tin mills over 1,500,000 tons of coal, or its fuel equivalent, equal to 750,000 days' labor of one man, or the labor of 2 500 men 300 days in a year.

In the matter of rolling mills: This 42,284 tons of tinplate would require, say 400,000 tons of sheet iron or sheet steel. This is equal to nearly half the total production of sheet and plate iron and steel in the United States in 1890, and more than equal to the production of sheet iron and sheet steel of the gauges that form the bulk used in the manufacture of tinplate.

In the matter of the number of men employed in the tinning process: It is difficult to arrive at just the labor in a ton of sheets, but it would be at least below the mark to assume that it requires four days' labor to produce from the pig iron a ton of sheet iron or sheet steel. This would be equivalent, then, to 1,600,000 days' labor in the sheet mill, or the labor of 5,333 men 300 days.

In the calculation as to the wages paid, which must be accepted with a possibility of considerable qualification, it is approximately estimated at an approach to $15,000,000, and, as stated by our contemporary, is equivalent to 5 649,600 days' labor. This, at an average of $2.50 per day, would be equivalent to $14 124,000 paid out in wages. The fact that the declared value of the amount of tinplate above named was $28,325,295 will show that this estimate is probably far below the mark. We think it would be fair to assume that fully 20,000 people would be given employment directly if the amount of tinplate named were made in this country, and more than four times this number of people given employment indirectly.

These figures as quoted represent an enormous development of industry, which may or may not be incorporated in the results, but with all possible margins for excess have yet a profound significance.

Extensive Coal Conveying.

At the Kensel Green Gas Works, of London, there is in operation what is said to be one of the most extensive coal-converting plants in the world. Eighty tons of coal per hour are automatically taken from barges and passed direct to 500 retorts and to thirty-eight storage bins. The work requires only the slightest supervision, the machinery acting with almost human intelligence. Two crane elevators raise the coal from the barges and drop it to a hopper made up of several screens which separate the coal into different sizes. The large pieces go to a breaker whence they gravitate to the conveyor where they join the other coals. The eighty tons are taken by this conveyor through an underground passage for thirty-five feet. The retorts are arranged in a line 400 feet long, and by a clever tilting arrangement the coal is dropped into them from the steel buckets of the conveyor.

LAKE SUPERIOR MINING NOTES.

What is believed to be a valuable deposit of ore was recently struck in the bottom of the East Jackson.

At the Iron Valley, which is to the northeast of the New York mine, they are exploring with a diamond drill. The first hole started was bored only a short distance when broken ground, which was encountered, tore the diamonds from the bit. A fresh hole was started and better headway has been made. The property, like its neighbor, the East New York, is one upon which a large amount of money has been expended in the search for a mine. The location is favorable, and there is room for a large deposit between the diorite, which rises upon the south and east of where exploration is in progress.—[Iron Ore.

Mr. E. A. Gott, President and Treasurer of the Dexter mine, has been looking over the latter. He expected to meet other shareholders here to talk over the prospects of the future, but was disappointed. There are several in the company who do not care to advance further funds, and money is needed to carry on explorations. The property is one that should be explored. It offers good encouragement for such treatment, and it should be applied. The diamond drill might show up considerable now unknown. The ores of this mine are manganiferous, often to such extent that the product is undesirable, much of it yielded from 6 to 8 per cent. Some holding as high as 12 per cent. has been united and meets a ready market.—[Iron Ore.

The drill on the south slope of the second level of the Mansfield mine is now in about 150 feet from the breast of the slope where the yellow ochre was encountered. The drift went through about 20 feet of mixed ore and struck clean Bessemer in which they are working. No. 1 shaft is being sunk from the third to the fourth level. The distance is 70 feet and the shaft is about 20 feet from the bottom.—[Florence Mining News.

At the Winthrop the diamond drill has shown the existence of a quartzite formation to the south of the main mine, that is causing considerable talk amongst mining men. This rock lies between two diorite hills, there being several hundred feet separating the two latter. Some distance to the west there is an outcropping of quartzite, but it was generally looked upon as a turn of the formation. None looked for a continuation eastward in a direct line. At last report the drill had penetrated 60 feet into the quartzite and the latter had changed from a whitish to a reddish tinge. There is yet about two hundred feet before the diorite will be reached, and in that distance is plenty of room for a big mine. The finding of quartzite at this point certainly augurs well for the presence of ore, which we trust the company will find.—[Iron Ore.

The Badger (Commonwealth Co.'s mammoth new find) commenced making regular shipments to Escanaba, on Tuesday, and up to Wednesday night had forwarded 420 tons. Supt. Davidson is now hoisting and shipping at the rate of 400 tons per day from the new find, and will make an enviable record by the close of the season. A large amount of developmental work is steadily progressing at the new mine, including the sinking of another working shaft, stoping, etc., and another level is contemplated.—[Florence Mining News, July 13.

The crosscut at the Buckeye penetrated a small seam of green stone last week, and then struck a body of excellent ore, almost identical with that yielded by the Badger, the Commonwealth Co.'s new find. The crosscut is now in some ten or twelve feet, and is breasted in the same kind of ore, although it is slightly mixed with quartz. The indications are, however, that the ore will clean up in a few days. Everything points to a very large body of high grade non-Bessemer ore, upon this promising property, and everybody is daily watching the developments with more than an ordinary degree of interest.—[Florence Mining News.

On July 3d a controlling interest in the Mikado property, about a mile east of Ramsey, was sold to Detroit parties who purchased it, it is understood, for the Palm's estate. The interest sold was owned by Leslie J. Perry and W. Roberts, of Waupaca. The Mikado has been in operation for a number of years, but through lack of funds has never been properly worked. A very fair body of ore has been developed at a depth of nearly 200 feet, and it will, if properly operated, probably become a paying mine.—[Ironwood Times.

Speaking of the recent order from the managers of certain Menominee range mines that the reports of weekly shipments of ore should no longer be given for publication, the *Evening Wisconsin* comments as follows: "Whatever may be the immediate effect of the newly adopted policy of the Wisconsin and Michigan iron mine owners, who have suppressed the publication of the weekly statement of ore shipments which has always heretofore been given to the newspaper press, the ultimate result will be to assist mere speculators, and to correspondingly embarrass and injure the legitimate trade. The more uncertainties there are in any business, the greater the scope which it affords for the gambling speculator, and the more likely is he to be attracted to it as a field for his selfish and useless activity. The less certainty and the more gambling there is in a business, the slenderer its rewards to those whose methods are steady and conservative and withal honest, and who do not make it their constant aim to get a living without working for it. It is as inconsistent for people who intend to do a legitimate business to suppress trade statistics as it would be for citizens who intend to be honest to put out the lights in the streets at night.—[Pick and Axe.

NEW GERMAN PATENT LAW.

On the seventh of April a new patent law was passed in Germany, to take effect on the first of October next. In this admirable law, which was framed by a commission and passed en bloc by the Legislature, all the gross defects of the old law have been removed and very valuable and equitable innovations substituted. The following are the most important changes: Each application is examined as regards novelty and patentability by a single number of a board of technical examiners appointed for life. If he does not see his way to pass it as it stands, he has an interview with the applicant or his agent suggesting alterations. If they cannot agree, a junta of three other members of the board sit on the case and decide, after hearing the applicant. The latter can appeal from their decision to the board of appeal, consisting of legal and technical officials independent of the board of examiners. The board of appeal again hears the applicant and finally decides the matter. It has power to return the appeal fees or to levy costs as it thinks fit. The patent office is the sole judge of the novelty and utility of an invention and in the matter of infringements of patents. When these cases crop up in a court of law the latter is to be referred for decision to the patent office. From the decisions of the patent office, however, in regard to revocation or infringement of patents, appeal can be had to the supreme court. The first applicant for a patent for any given invention has a right to the patent, if new, over every other applicant, with this exception, that if in the case of existing patents any one opposing can prove before October 1st, 1894, or in the case of future patents within five years from grant of same, that the invention was copied from his designs, models, or arrangements without leave, then the patent can be granted to the opposer. After these dates a patent cannot be annulled on the ground of want of novelty, patentability, or even fraud on another. A patent during the last ten years of its life is thus practically invulnerable. Medicines, food, and chemical substances are, as under the present law, unpatentable, but processes for their manufacture can be protected, and the protection will cover the actual article manufactured by the process. Where there is reasonable suspicion that the article has been manufactured by the patented process the proof that it has not been so manufactured rests with the manufacturer or importer, and in default of such proof he is adjudged guilty of infringement

AMERICAN TIN.

On the 15th ult. the first consignment of native tin ever put on the market in America was sold in San Francisco at a satisfactory price. The seven tons offered—the first fruits of this new American industry—were smelted at the Temescal mines on the property of the San Jacinto Estate, Limited, in California. The San Francisco *Chronicle*, in announcing the sale, says that the tin offered was the result of 10 days' experiments rather than the actual working, and a cable since received by the London representatives of the San Jacinto Estates announces that 38,000 lbs. of fine tin have since been shipped to St. Louis. We quote the following from the San Francisco paper already mentioned:

"All the tin heretofore used in the United States has come from Wales or Australia, but in a very few months the Temescal mines will be abundantly able to supply the entire American market. This home market, too, is about to develop largely through the establishment of tinplate factories in the East, which will become consumers of California tin. Considerable correspondence about this supply has been exchanged between Manager E. M. Robinson, of the mines, and the Eastern tinplate manufacturers. The mines in question have been shown to be the richest in the world, and their future production will be limited only by the market. For several months experiments to determine the best kind of machinery and furnaces to use on a large scale have been going on at the mines. A five-stamp mill, three or four kinds of concentrators and a furnace to try the experiment of using oil instead of coal for fuel, were put in. The furnace has been very successful, and it has been shown that the work can be done with oil in half the time required with coal. Large stamp mills, furnaces, &c., are in process of erection now, and an immense establishment will soon be completed. Congressman W. W. Bowers, of San Diego, who is here with Mr. Stewart, says that $20,000 worth of machinery from England is now on the ground waiting to be put in place. 'According to present plans,' said Mr. Stewart, 'the mines a year hence will be capable of turning out 2,500 tons of tin a year, with an almost unlimited capacity for increase.' The importance of this product will be seen when it is remembered that the highest annual product of the world has been 10,000 tons and the average is about 9,000 tons. Few people appreciate the extent and importance of the large operations for which preparations are rapidly being made at these mines."

The tin business is new to California, and the newspaper people may be excused if they are not well up in it at present. The remark that the Temescal mines will, in a few months be able to supply the whole of the American market, is stultified by the statement that in 12 months' time 2,500 tons of tin can be produced annually at the mines, for it requires at least 10,000 tons of tin to supply the yearly requirements of the United States. We ship fully the quantity named to American ports annually, and only about one-twentieth of the total is Cornish (not Welsh) tin. So that if the Temescal Mines fulfill their promise, the tin smelters in Australia and the Straits Settlements will be principally affected.—[Iron and Steel Trades Journal (London).

A Novel Hoisting Machine.

The *Timberman* says: A novel machine, called a whip hoisting drum, has been invented in Rhode Island for unloading lumber and other freight from vessels, and is found to be a great improvement on ordinary methods in the saving of time and labor. The machine has three drums which operate two derricks and a central line which runs to the hold of the vessel; the power is furnished by an electric motor of 10 horse-power, the capacity of the motor being 500 volts and making 1,600 revolutions to the minute. A belt connects the motor with the shaft which operates the drums, the power being transferred to the drums by what is called a paper friction; each drum is operated by a lever and can be stopped in an instant. The motor is a self-oiling machine, a drop of oil falling on the bearings every 30 seconds. When the lumber is drawn from the vessel, a large hook from the wharf derrick is attached, and the sticks are transferred in the most ready manner to any part of the yard.

THE AETNA ENGINE.

In designing the Ætna engine, herewith shown, the aim of the improvement has been to supply an engine which, while realizing the highest economy in the use of steam, will also be economical in attendance, repairs and space; simple in construction, strong, durable, neat in appearance; an engine which can be handsomely finished at a moderate cost. These conditions they claim have been fully realized in the engine referred to.

They have endeavored above all things to have the details of the engine perfect in every part, and well adapted for the uses intended. We call particular attention to the balanced valves, the invention of Mr. F. I. Freeman. This valve is simple, easily adjusted, and absolutely positive in its operation. Its operation will be easily understood by reading the following explanation and carefully referring to the letters in the cuts:

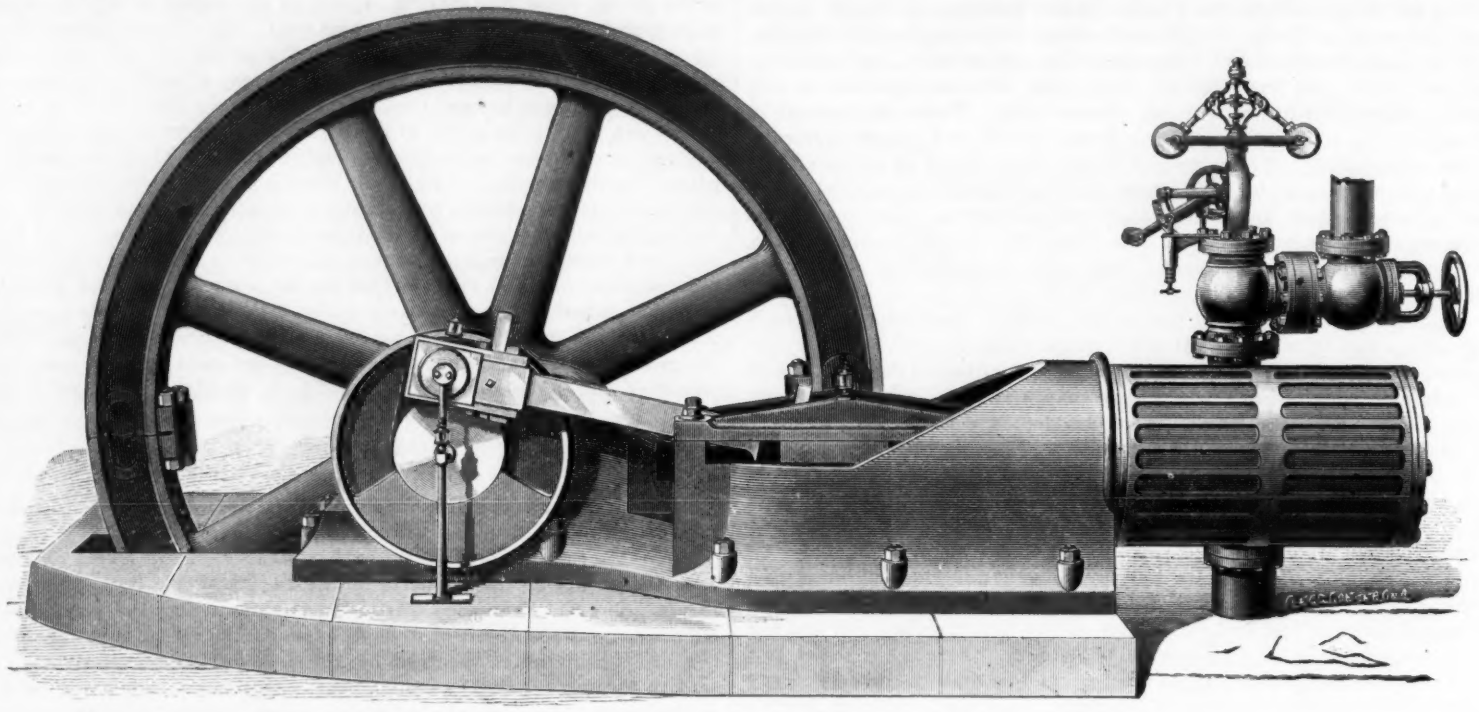


FIG. 1.—AETNA ENGINE.

Fig. 3 represents a horizontal section through the center of the cylinder, valves and steam chest; Fig. 4, a cross section through the steam port; Fig. 5, a cross section through the exhaust port. Referring to the parts as shown in Fig. 3: A represents steam chest lid or cover; B B, the two steam ports; C C C C, the four clamps on the valve rod that holds the valves in position; E E, the two exhaust ports; S S, the two false exhaust ports in the outer valve seat; T T, the two false steam ports in the outer valve seat; V V, the valves; W W W W, the two outer valve seats and the two adjusting wedges; L L, end of pipes which carry the steam from the cylinder into the false steam ports in the outer valve seat; O O, end of pipes that carry the steam from the exhaust cavity into the false exhaust ports in the outer valve seat.

Fig. 4, X, cavity for live steam which extends entirely around the body of the steam chest; Z, pipe which carries live steam from the steam pipe above the engine throttle-valve into the cavity that surrounds the steam chest. No. 1, set screw for moving the adjusting wedge; No. 2, one of the cap screws for securing the outer valve seat and wedge after the valve is properly adjusted.

The outer valve seats are secured against end motion by tongues and cavities in the steam chest, adjusting wedges and false seats. They are also held firmly in position by four cap screws which pass from the outside of steam chest cover through the adjusting wedges and are screwed into the outer value seat. After the engine is finished and the valves are set the same as if they were ordinary slide valves, the wedges and outer valve seats are placed on the steam chest lid or cover, and the lid put in position as shown in Fig. 4. The outer valve seat is then adjusted by screwing up the adjusting wedge by set screw No. 1, as shown in Fig. 4, until the valve moves freely between the two valve seats, just tight enough so that the steam can not pass between the faces of the valves and the seats. The wedges and seats are then secured to the steam chest cover by means of the cap screws. The valves are then adjusted. When the steam port is entirely covered there is a pressure nearly equal to boiler pressure on the under side of the valve, for the reason that at this time the compression begins to take place, consequently if it were not overcome there would be a tremendous pressure against the under side of the valve and face of the outer valve seat. To overcome this the manufacturers simply carry the steam from the cylinder through the pipe F, Fig. 4, into the false steam port in the outer valve seat. This causes exactly the same pressure on the outer side of the valve that is had on the under side. Any pressure from exhaust steam is counteracted the same way by means of a pipe shown in Fig. 5.

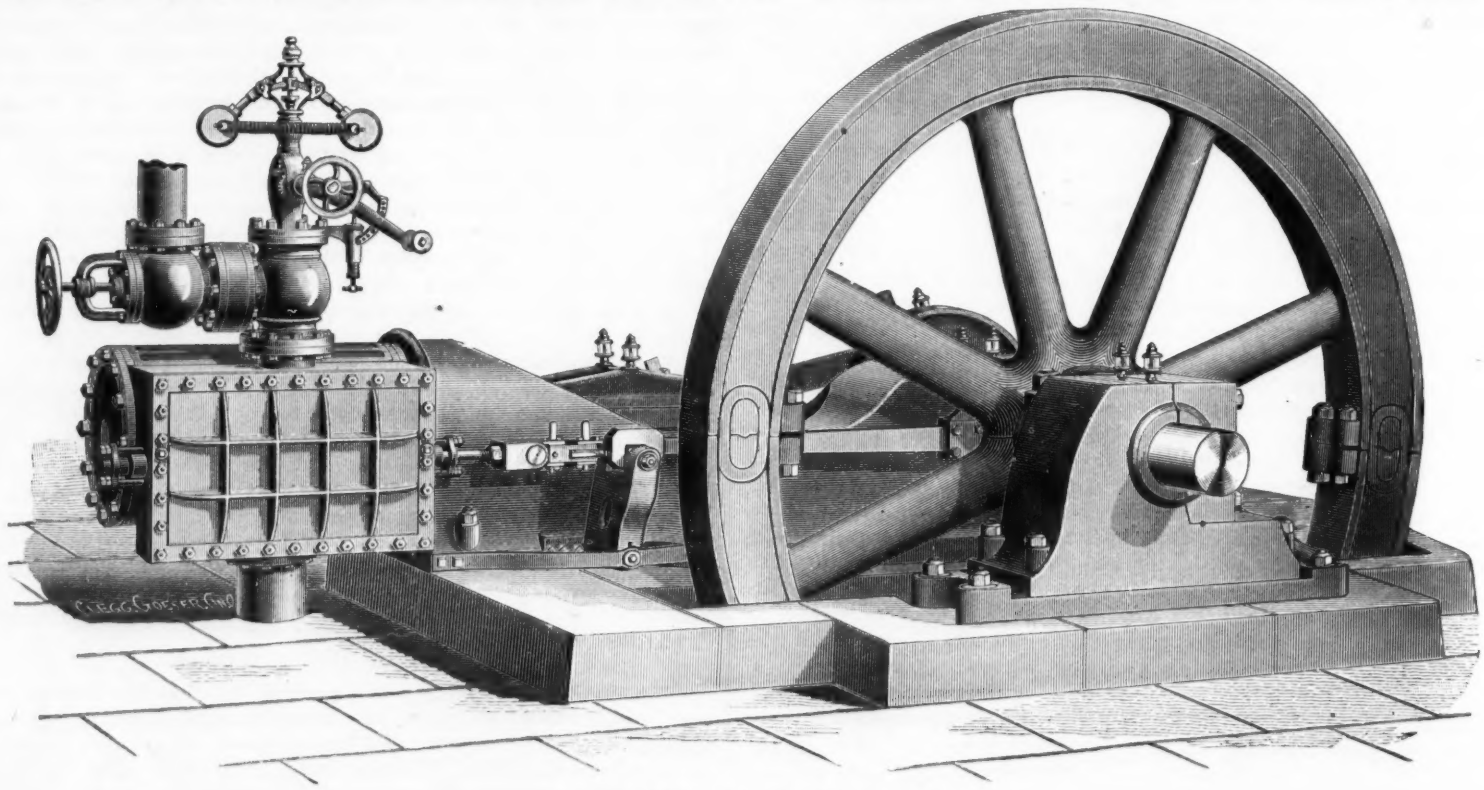


FIG. 2.—AETNA ENGINE—BACK VIEW.

These engines have been in use for years, and have given the highest satisfaction. They were formerly manufactured by the Aetna Machine Co., of Warren, O., of which Mr. F. I. Freeman was General Manager. Mr. Freeman has since connected himself with the Totten & Hogg Iron & Steel Foundry Co., of Pittsburgh, which company is now the sole manufacturer of the Aetna engine.

A CURIOUS BOILER EXPLOSION.

When a boiler explosion occurs, there are two things that the public thinks of at once. In the first place, they are apt to feel pretty sure that the water was very low, and that the fireman turned the feed on suddenly, and that

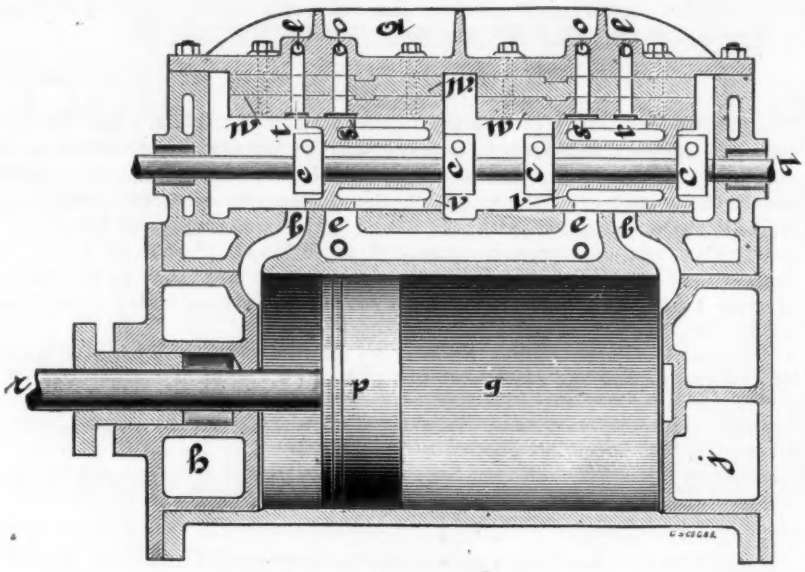


FIG. 3.—ÆTNA ENGINE.

when it came in contact with the overheated plates and tubes, a tremendous body of steam was instantly generated, and a disastrous explosion was the result. We have often expressed our opinion concerning this kind of explosion, and experiments recently made in England bear us out. It does not seem likely that any very great amount of water can be evaporated in this

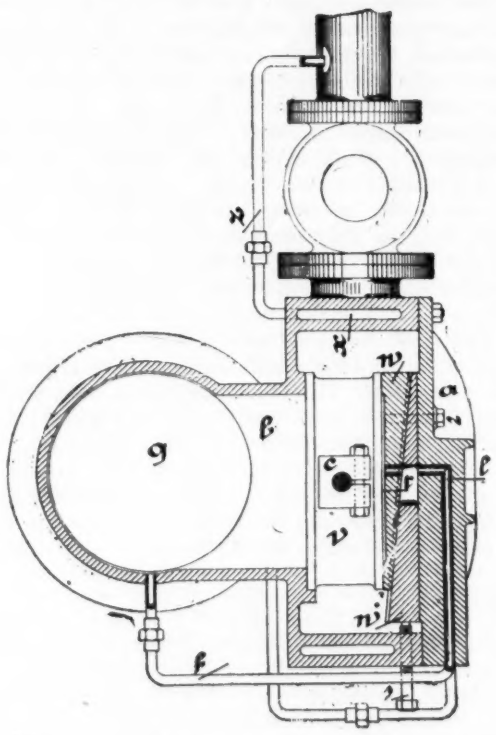


FIG. 4.—ÆTNA ENGINE.

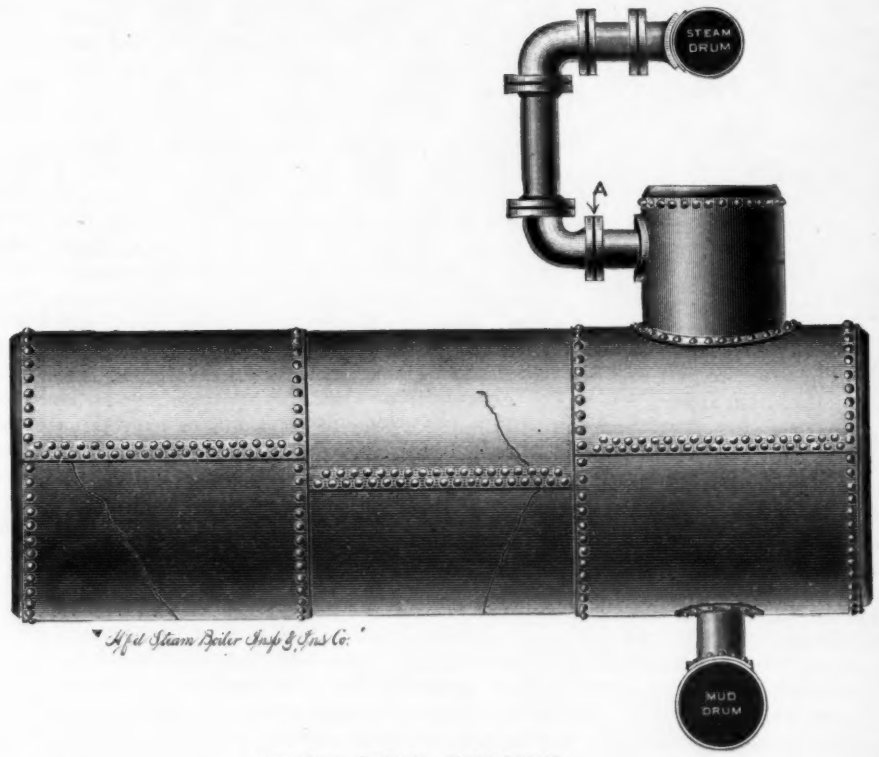
way, for the latent heat of steam is so great that it would take many pounds of red-hot iron to vaporize one pound of water. Of course we do not advise the fireman to try the experiment of spraying cold feed water upon hot plates, but the objection we have is of a different nature from the one outlined above. When a red-hot plate of metal is suddenly cooled, severe strains are set up in it by the violent contraction that results. The joints are likely to be started, and perhaps the plates may be cracked, especially if they have been burned by a somewhat prolonged overheating. In this way, the boiler may be materially weakened so that it is not safe to run it at the ordinary pressure, and an explosion may result.

When low water cannot be assigned as a cause, the public usually concludes that some mysterious agency has been at work—something never yet identified and perhaps not yet suspected. In the present issue two theories of such action are proposed, with what probability of truth we leave it to our readers to decide.

Now, we have no wish to check the progress of discovery in this or in any other direction, and if any hitherto unrecognized cause of explosion can be shown by experiment to exist, we shall be pleased to look into it and shall endeavor to devise a means of avoiding it. Having had some 22 years of experience in such matters, however, during which time we have carefully investigated a large number of explosions, we must say that no case has ever come to our notice where it was necessary to assume unknown forces to be at work. In fact, the wonder is, not that so many boilers explode, but that so few of them explode.

A number of cases have come to our notice in which boilers have exploded during the night or at other times when there was (presumably) little or no fire under them. In every instance of this kind where we have been able to make an investigation, some satisfactory and sufficient cause has been found; and we believe that some well-known cause could be found in every case.

The cut accompanying this article represents a boiler that exploded a short time ago from a curious cause. It was one of a battery of four. It was 12 feet long and 48 inches in diameter with a dome 24 inches in diameter and 24 inches high. Shell was of steel, double riveted, ¼ inch thick. There were 54 tubes each 12 feet long and 3 inches in diameter. There was also a 12-inch



CURIOUS BOILER EXPLOSION.

steel drum and a 16-inch mud drum. Steam was taken from the side of the dome as shown in the cut. In connecting the steam pipe to the dome, the engineer used a stout rubber gasket at A, which he trimmed neatly around the outside of the flange. He forgot, however, to cut a hole through it for steam to pass through. If the full boiler pressure had acted on the blind gasket, it would probably have bulged it out and burst it, forcing way out for itself; but under the circumstances the effective pressure on the gasket was only the difference between the pressure in this boiler and that in the others. Even then, it hardly seems as though the rubber would be strong enough to allow the pressure to run up to the bursting point, but it was strong enough, for it was afterwards found unbroken; and the boiler blew up and did over a thousand dollars' worth of damage. The course of the fractures is indicated in the cut. Fortunately, nobody was hurt.—[The Locomotive.

Bessemer's American Rival.

The origin of the Bessemer process of making steel has always been an honor divided between Sir Henry Bessemer and an American, William Kelly, who used the process now bearing Bessemer's name at a little old-fashioned furnace in Lyon county, Ky. The ruins of the old furnace still mark the spot, and it has been suggested that the furnace and the diminutive steel converter used by Kelly, shall be restored and placed among the exhibits at the Chicago show.

IRON chimneys of somewhat unusual design are now built in all sizes by the Philadelphia Engineering Works, Limited, of Philadelphia. The casing of the chimney is made of plate iron, strongly riveted, and thus forming a continuous shell from the ground to the top.

MAKING SUPERIOR IRON FROM AN INFERIOR QUALITY.

A number of gentlemen connected with the manufacture of iron and steel, and including two manufacturers from Australia, assembled at Messrs. H. Young & Co.'s iron foundry, Eccleston Street, Pimlico, last week, to witness the production of a superior from an inferior quality of iron by the aid of a new flux which has been named Stephanite, after its inventor, Mr. Stephan. The point involved is the addition of aluminium to iron. By adding aluminium to the charge of iron in the cupola in the ordinary way it is found that the blast carries it away and that the admixture is not effected. By adding it to the molten charge of iron in the ladle stirrers have to be employed, and this does not affect a uniform admixture of the aluminium with the iron, and a homogenous metal does not result; it is merely a mechanical compound. What the late Mr. Stephan did was to take certain proportions of alumina, emery, and lime, to incorporate them together, and to press them into briquettes. These briquettes are added to the charge of iron and coke in the cupola in the proportion of 80 pounds of Stephanite flux to one ton of iron. The action which is then said to take place is that the high temperature of the furnace converts the alumina into metallic aluminium gases, which are absorbed by the molten metal, and thus form a chemical compound as contra-distinguished from a merely mechanical one. It is claimed for the flux that it acts as a clearing agent on the metal, and separates every particle of it from the slag; that the molten metal leaves the furnace in a highly fluid condition, and that consequently better castings are obtainable and blow-holes are avoided. At the demonstration at Messrs. Young's works a cupola was charged with three tons of very poor cast-iron scrap, with the prescribed addition of 240 pounds of Stephanite. The whole of Messrs. Young's large foundry was placed at the disposal of the Stephanite Co., of Blomfield House, London Wall, who are introducing the invention. Messrs. Young (says the *Times*), having previously satisfied themselves of the bona-fide and practical character of the invention, resolved on having the whole of their castings for that day large and small—run from the new metal. The castings were so run, and the great fluidity of the metal was seen from its behavior in the ladles, into which it was run from the cupola. When sufficiently set two castings were taken from their moulds, and, while at a cherry-red heat, plunged into cold water. This was a crucial test to begin with, as ordinary cast iron similarly treated would either have flown to pieces at once or as soon as it received a blow. Here it did neither, for after being quenched one of the castings was broken in half, and showed a very good steely fracture. The file was applied to these castings, but failed to make more than a mere surface impression on them except at one point of one of them—the end—which, in common with ordinary castings, was found to be somewhat softer than the center of the piece. One half of the casting was then heated in a blacksmith's forge and cooled in the air. It was then found to be soft and amendable to the file. The same piece was then reheated, and when at a cherry-red was plunged again into cold water. After cooling, on again being tried with the file, it was found to resist it most successfully. The opinion of those present qualified to give one was that it was a most remarkable result, and that the invention appeared to be one capable of very wide application. So far as the trials went, they demonstrated the production of what may be considered as a new metal.—[Glasgow Engineer.

A FORECAST OF THE IRON INDUSTRY.

The year of 1891 will mark an important era in the iron industry. Commencing the year with enforced idleness on account of a great coke strike and railroad fight, the iron mills have gradually recovered ground as regards better prices for iron and an ample supply of coke, and they now close the first half of 1891 in a fairly prosperous condition. Prominent iron men are quite jubilant over the brightening prospects in the trade. Though no sudden nor considerable rise in prices is expected, a good healthy business is before them. During the first quarter of the present year, a larger number of iron furnaces were out of blast in this country than was ever known before at one time. Gradually, however, the fires under these furnaces were lighted, and just before the annual July shut down for repairs, the number of idle furnaces was comparatively small.

The most disturbing feature of the present market is the apprehension felt regarding the new amalgamated scale. Several important mills in the association are dissatisfied with some of the provisions of the new agreement and have withdrawn. It is hoped for the general benefit of the trade, however, that existing differences will be settled amicably and that no serious labor troubles will disturb the situation.

One very serious effect of the recent depression in business is that this Spring a régime of low prices was established, from which the furnaces will find it hard work to break away. Though there is a better demand at present for iron and higher prices are now obtained than would have been possible in the first of the year, they are still on a low basis, and those manufacturers who are too hasty to put up prices when the demand improves this Summer or Fall are likely to find themselves losing orders.

The branch of the trade which will receive the most improvement this Fall is the structural iron business. Labor troubles are not feared now, and investors who intend to put up new buildings, but who were delayed owing to the unsettled financial and labor situation earlier in the year, will, with the present bright future before them, start new enterprises this Summer or Fall. The plate iron mills are anticipating an improvement and are already stronger in their views. Pipes and tubes will also share in the improved situation, as steam heating work will undoubtedly be very extensive this Fall and Winter.

But little improvement, however, is looked for from the natural gas and petroleum fields, especially the latter, as they are now paying less than for years. The outlook in merchant steel and steel rails is less roseate than in other lines. Although railroad building will be much larger for the last half of the year than it was the first half, the total aggregate for 1891 will scarcely exceed 4,000 miles. The total shipment of rails the first half of this year amounted to 450,000 tons against 775,000 tons during the same period last year. Light sections are enjoying an exceptionally good demand from electric street railways, and with the general improvement anticipated in the electric business during the next six months, a still more promising business may be looked for.—[Boston Commercial Bulletin.

The Fire Record.

The fire loss during June in the United States and Canada, while nearly 50 per cent. less than in May, is in excess of that of the last two years, being, as compiled by the *New York Commercial Bulletin*, $85,876 25. During the month there were 188 fires in which the destruction of property was more than $10,000 as compared with 258 fires of this same degree of intensity in May. The June fires may be classified as follows: 78 of from $10,000 to $20,000 loss; 32 of from $20,000 to $30,000; 36 of from $30,000 to $50,000; 24 of from $50,000 to $100,000; 12 of from $100,000 to $200,000, and 6 from $200,000 to $420,000.

The following table gives the total by months of the comparative losses for the first half of the years 1889, 1890 and 1891:

	1889.	1890.	1891.
January	$6,898,700	$9,179,300	$11,230,900
February	12,800,000	7,387,025	9,226,500
March	10,912,000	8,466,300	12,540,750
April	15,987,000	8,285,520	11,309,000
May	9,915,300	8,838,100	16,660,395
June	7,755,400	5,655,000	8,587,625
Total	$56,513 000	$47,811,245	$69,555,170

It will be seen how much heavier the losses have been this year than last while they exceed by more than $5,000,000 the total for 1889. From this showing it is easy to comprehend that many insurance companies have found the past six months an unprofitable period, and have had to draw on their investments to meet their losses.

Modifications in Steel Making.

The employment of steel produced in Siemens-Martin furnaces is at present very extensive, particularly for shipbuilding and engineering purposes. The "mixture" at present most largely employed in the Siemens-Martin furnace is pig iron together with a certain quantity of "scrap" iron or steel. It is stated that the supply of this latter ingredient is smaller than is necessary to meet the rapid development of production, and that in a comparatively short time it will become difficult to obtain "scrap" of the necessary quality at a moderate cost. Several French metallurgists have therefore been lately experimenting in practice with the "ore process," in which ironstone is substituted for scrap along with the pig iron in the furnace. The result of these experiments is to prove that important advances in the efficiency of Siemens-Martin steel can be obtained with such a charge, when melted in a furnace with a neutral lining. The steel thus produced is said to possess important advantages over the metal obtained from a basic lining. This improvement is due to the incorporation of the steel with the chromium in the lining, which it absorbs to the extent of 10 to 15 per cent. The steel thus produced possesses a much higher degree of elasticity than other forms of the metal with a corresponding content of carbon, and can be submitted successfully to much severer tests. It is asserted in France that the result of the experiments will be to open up new fields of employment to steel for which it has hitherto not been considered sufficiently trustworthy.—[Mechanical World.

Bright Device for Fixing a Shaft.

The emergencies of marine disasters often tax the genius of engineers to an extreme, and the manner in which a large British steamer, with a broken propeller shaft, was set aright not long since at Algiers, is worthy of preservation in mechanical history. Both the shaft and the tube through which it passes at the stern were broken and the vessel lay in port until the arrival of another shaft and tube from England. It was then found that the tube was larger than the opening in the stern. The tube was fastened to one of the coupling faces of the sound portion of the shaft, just as it would be chucked in a lathe. The ship's engine was run slowly and by means of an improvised slide rest the tube was turned down to the proper size. The tube and shaft were fitted in place, and the steamer resumed her voyage without having been placed in dock, the stern being raised out of water by shifting the cargo forward.

Cast Iron Pipe from Alabama.

The first train load of large cast-iron pipe ever made in the South for the Eastern market was made by the Howard-Harrison Iron Co., of Bessemer, Ala. and recently left Bessemer by the Richmond & Danville RailroadforBaltimore, Md. This was the first shipment on a 5,000-ton contract of 36 inch pipe for the city of Baltimore. The Howard-Harrison Iron Co. is now turning out 125 tons of pipe per day from 24 to 48 inches in diameter. The shipment consisted of 25 cars loaded to their full capacity. Shipments will be continued at the rate of 75 tons per day until the contract with the city of Baltimore is completed.

Cement for Iron Castings

The following cement for uniting iron castings is said to give good results: A mixture is composed of equal parts of sulphur and white lead, with about one-sixth portion of borax, the three being thoroughly incorporated together, so as to form one homogeneous mass. When the application is to be made of this composition, it is wet with strong sulphuric acid, and a thin layer of it is placed between the two pieces of iron, these being at once pressed together. In five days it will be perfectly dry, all traces of the cement having vanished, and the work having every appearance of welding.

STEAM USERS Should Read this.
Increase the Capacity of your Boilers.
Scale is a Non conductor of Heat.

SAVE YOUR FUEL AND PROTECT YOUR BOILERS FROM SCALE AND GALVANIC ACTION OF WATERS. WATERS ANALYZED **FREE** AND THE COMPOUNDS MADE TO SUIT EACH WATER.

INTERNATIONAL BOILER SOLVENT.
(PURELY VEGETABLE.)

Dearborn Drug & Chemical Com'y,

Manufacturing and Analytical Chemists, W. H. EDGAR, Manager. Office, Room 29, Rialto Building; Works, 4246 Champ'ain Avenue;
Ohio Office, Canton, O. ROBERT H. CREVOISE, Agent.
WRITE FOR INFORMATION AND PRICES. BEWARE OF INFRINGEMENTS.
CHICAGO, ILL.

A PLEA FOR SMALL MANUFACTURERS.

In a recent issue of the *Chattanooga Times*, General Manager A. N. Shook, of the Southern Iron Co., writes instructively on a subject equally applicable to all parts of the country, though designed for Southern trade. He urges that the young men of the South and West should take especial interest in manufacturing. In particular, he presents a forcible plea for what may be classed as the smaller industries and maintains the idea that they can be profitably carried on in almost any of the cities and towns in the South and West. It does not take, he says, a very large amount of money to start such establishments, and almost any town has a sufficient quantity of native skill to learn to carry them on.

Blast furnaces and rolling mills are very expensive and will not pay everywhere, but they form a very small percentage of the manufacturers that could be profitably carried on in the South. The barrier to these smaller industries is not poverty, he contends, but want of proper application in that direction. The agricultural districts should pay more attention to manufactures, in the interest of the employment of the rising generation. Now, they must do one of two things; go into the towns, secure positions as clerks or bookkeepers, or enter the professions (which promise but little now) and become parasites upon their respective communities, for the facts are that all the people in the professions other than agriculture and manufacturing in its more comprehensive sense, are parasites. Unless they do this, they grow upon the farm at home, the boys marry the neighbor's daughters, build a cabin in the corner of the father's or father-in-law's field, and settle down to raising corn and cotton, until the land becomes too poor to cultivate, or the acerage insufficient, when they are forced to bundle up and go to Texas, where the same thing is repeated. Small manufacturers present a better chance in the race of life to young men, and it is wrong to leave them the two only alternatives mentioned.

It may be necessary to commence in a small way, but a start ought to be made at once, he thinks. If we look back at the history of all the industrial enterprises of this country we will find that they have generally sprung from a small beginning, and in this connection coal development at various points in Tennessee was mentioned and the experiment of making pig iron at Tracy City, Tenn. A furnace was built and named "The Fiery G'zard;" the blowing engine was an old saw-mill engine; the water to cool the tuyeres was pumped by hand; the stock was elevated by a hand elevator; the blast was heated by building a flue under a stove p'pe, which was used for a blow pipe. "The Fiery G!zard" ran three days and made fifteen tons of iron, but it demonstrated that iron could be made with the coke made from that slack and from the ores that were then being mined at Birmingham, Ala., (this being the first iron ever made from Red Mountain ores). Had it not been for this small beginning made by the Tennessee Coal, Iron & Railroad Co. in the manufacture of pig iron, that company would have long since been a thing of the past and forgotten, and the Southern Iron Co. would never have had an existence.

These instances are mentioned to show that while it may be desirable, yet it is not necessary that one should have large capital in order to start manufacturing. Start with facilities you have and improve your product as you can.

STEEL WITHOUT PIG.

The following is from a Washington dispatch to the *Commercial Gazette*:

Passengers by the Queen & Crescent through line from Cincinnati to Charleston will see to the left of the train at Johnson City, Tenn., a new furnace of large proportions. It was erected as a Bessemer iron works, and is planned to be the most extensive of the kind in the country. It is soon to become the pioneer establishment in the United States for the production of steel directly from the ore. The process is one heretofore known to and used only by the Russian government. An inventor and artisan in iron, resident near Washington, has perfected the plans for a plant which is an improvement on the Russian method, and which experts in iron manufacture, after due examination, have declared will undoubtedly produce steel of the first quality directly from the ore, without the necessity of the usual preliminary reduction to the pig. In a word, the ore from the mine is fed into the furnace, and in the course of the reduction it becomes carbonized, and the product, as obtained by the single operation, is steel in the state in which it is delivered by the various other methods which begin with the pig, after an independent reduction to this latter form. A strong company has been formed to develop this method. It is easily seen that if successful, it must revolution'ze the steel industry of the country and bring the cost to very much lower figures. The new steel enterprises of the South are of vast importance, not only to that section and the regions immediately tributary to it, but to the whole country. One plant has been in operation in Chattanooga some months, and others are in process of construction. There is another which expects to compete for the new steel guns near Cumberland Gap. The steel sheets for the new American tinplates are likely to be nearly all produced in the Chattanooga region, on account of the low figures at which they can be manufactured. The ores used at Johnson City are from the famous Cranberry mines on the border of North Carolina. The quantity of ore in sight is beyond computation. It is mined and delivered at the furnace at a cost of 50 cents a ton. Besides the advantages of these low figures, it has been proved to be the best ore for the manufacture of steel found in such quantities.

Steel Girders for Mining Purposes.

The use of steel girders in place of timber for supporting the roofs of colliery workings appears to be growing in favor. In Staffordshire, where the change has been found very profitable, steel girders are being manufactured and employed extensively for this purpose. At one large colliery alone in the Cannock Chase 12,000 of these girders have already been fixed, and they are being adopted also in Derbyshire and South Yorkshire. Of course the steel supports are themselves more cost'y than timber. They are, however, put into position with much less labor and are vastly more durable. In the Staffordshire mines the timber supports will not last more than six months without retting, but it is calculated that the steel girders will remain good for from three to five years. In cases of settling down of the roof, when the timber support breaks and becomes useless, the steel girders are taken out and reversed, being merely bent, and on being replaced they become stronger because of their arched form. Some of them have been experimentally used for two years. Similarly steel pit props instead of wooden ones are being employed. The obvious effect of this substitution is not only economy in mining operations, but also a new demand for steel manufacturers, although it will, no doubt, lessen considerably the demand for timber for colliery purposes, and will lesson, to some extent, the amount of labor employed in coal mines.—[Coal and Iron Trades Review, London.

Business in the Northwest.

While this is the period of ordinary mid Summer dullness in most manufacturing and jobbing lines, it has proved a noteworthy fact that the volume of business in Minneapolis and St. Paul compares more than favorably with the same period of time one year ago, and is incomparably superior to most Eastern cities of corresponding size. Whatever the complaints of dullness there are, save for those usual at this period, come from isolated sources and from retail trade, which in the two cities make some complaint. The larger industries, such as flour milling, always find business dull at this period, and there is nothing unusual in the conditions surrounding them. In the lines of merchandise the movement of hardware has been quite active and the volume of business large. Reassorting orders from dry goods merchants have held up quite well despite the cooler weather of the first of the week. Groceries are fairly active. Boot and shoe manufacturers and jobbers have been mostly occupied in their semi-annual invoicing and preparations for the Fall trade. Financially, the conditions are more favorable than they were a fortnight ago. Both cities report no unusual demand for money and sufficient available to meet all calls. The crop outlook continues quite as promising as at our last report.—[The Hardware Trade, Minneapolis.

Wire Finer Than Hair.

We are at work just now, said a manufacturer the other day, on some pretty small wire. It is 1 500th of an inch in diameter—finer than the hair on your head, a great deal. Ordinary fine wire is drawn through steel plates; but that wouldn't do for this work, because if the hole wore away ever so little it would make the wire larger, and that would spoil the job. Instead, it is drawn through what is practically a hole in a diamond, to which there is, of course, no wear. These diamond plates are made by a woman in New York, who has a monopoly of the art in this country. The wire is then run through machinery which winds it spirally with a layer of silk thread that is .0015 of an inch in thickness—even finer than the wire, you see. This wire is used in making the receiving instruments of ocean cables, the galvanometers used in testing cables and measuring insulation of covered wires.

The First Excursion of the Season, via Erie Railway, to Niagara Falls and Toronto, Saturday, August 1, 1891.

Special train leaves from Central Passenger Station, Viaduct and South Water street, at 7:45 P. M., arriving at Niagara Falls 6 A. M., Toronto, 12 noon. $3 to Niagara Falls, Toronto, $4. Secure sleeping car space early, at 141 Superior street or Central Passenger Station, South Water street and Viaduct.

CENTRAL THOMSON-HOUSTON COMPANY,

48 ARCADE, CLEVELAND, O.

S. D. NESMITH, - - - - - - Manager.

Motors from 1-12 h. p. to 100 h. p.

ELECTRIC LIGHT PLANTS INSTALLED,

Arc and Incandescent, Direct and Alternating,

ELECTRIC FANS!

FANS FOR VENTILATING!

ELECTRIC SUPPLIES.

PROMINENT ASBESTOS MANUFACTURES CONSOLIDATE

The H. W. Johns Manufacturing Co., and the Chalmers-Spence Co., New York; The Asbestos Packing Co. and Chas. W. Trainer & Co., Boston; and the Shields & Brown Co., of Chicago—the five largest asbestos manufacturers in the United States—have formed a corporation under the name of the H. W. Johns Manufacturing Co. They will control most of the output in their line of business. The officers of all the companies and their chief employes will remain with the new concern, which will thus have the advantages of their combined skill and experience. H. W. Johns is the President; R. H. Martin, formerly President of the Chalmers-Spence Co., the new Vice-president; C. H. Patrick, Treasurer, and C. P. Erhard, Secretary, both of the last two named having previously been with the H. W. Johns Manufacturing Co.

The consolidation, which was effected July 1, was made, it is stated, to reduce the cost of asbestos manufacture and to save other expenses. The company promise to give their customers the benefit of the economy which will be thus practiced.

The H. W. Johns Manufacturing Co. was the name chosen for the new corporation, because the old company of that name was the pioneer in the business and had besides the largest factory and business. H. W. Johns began the manufacture of asbestos goods in 1858. Englishmen took their cue from him and have set up asbestos factories, but American manufacturers export their goods to Great Britain and elsewhere in Europe in considerable quantities.

The factory of the old H W. Johns Co. at the foot of 39th St., Brooklyn, N. Y., is already the largest one devoted to the manufacture of asbestos goods in the world, about 125 men being employed. A new building will shortly be erected which will employ double that number. Factories will also be run in Chicago and Boston. The old H W. Johns Manufacturing Co. also made asbestos fire and water-proof paints and roofing—an important branch of the business—while the other concerns confined themselves solely to the manufacture of asbestos steam pipe and boiler coverings, steam packings, fire-proof cements, fabrics, ropes and twines. The new company will also be sole agents for the sale of Vulcaneston, which is used largely for electrical purposes in the manufacture of switch boards, armature sleeves, battery cells and insulating parts for arc and incandescent lights, motors, etc. The manufacture of fire-proof asbestos theatre curtains will be an interesting branch of the business. There are almost 150 of these in use in this country, and the building laws of most of the larger cities prescribe that all new theatres must have fire-proof curtains. The major supply of asbestos comes from Canada, where the new corporation has extensive mining interests.

The new H. W. Johns Manufacturing Co. will have their headquarters at 87 Maiden Lane, New York City. There will be branch offices in Boston, Chicago and Philadelphia, and agencies in London and elsewhere abroad.

Some Data on Mannesmann Tubes.

According to an article recently published in the *Revue Universelle*, the power required in the rolling of tubes by the Mannesmann process varies from about 2,000 to 10,000 H. P., depending upon the size of the tube. In general, however, the power is required only for short periods of time brief intermissions being necessary for the adjustment of tube blanks. It is accordingly possible to do the necessary work with an engine developing a comparatively low power by storing up energy in a heavy flywheel revolving at high speed. At the Mannesmann works the flywheel of the 1,200 horse-power engine consists of a cast-iron rim, to which are securely bolted two steel disks measuring about 20 feet in diameter. Around the circumference of the wheel are wound about 70 tons of No. 5 wire under great tension, thus producing a wheel of unusually high resistance to bursting. The wheel makes 240 revolutions per minute, a point on its circumference, therefore, traveling about 15,000 feet per minute. The wheel is mounted on the main shaft, and the tube rolling machinery is driven through intermediate gearing.

The success of the Mannesmann process depends in no small part upon a practically perfectly homogeneous tube blank and a generally high quality of metal. The tube is therefore itself a guarantee to the purchaser. The tubes are made in lengths up to 21 metres (68 8 feet), and are of comparatively light weight. The great length available reduces the number of couplings necessary for a pipe line, and constitutes one of the important advantages claimed n point of economy.

NOTWITHSTANDING the depression in lake freights the *Inland Lloyd's Register* for July contains the names of nine new steamboats, with 8,767 tons net register and the aggregate value of $1,210,000, with one tankboat built at West Superior for the Standard Oil Co., bringing the aggregate tonnage and value up to 9,006 and $1,238,000 respectively.

IT WILL PAY

you to investigate the merits of

THE HACKNEY POWER HAMMER,

Endorsed by leading Manufacturers throughout the Country.

Catalogues and all information cheerfully furnished by

THE HACKNEY HAMMER CO., Cleveland, Ohio.

INDUSTRIAL SUMMARY.

New Enterprises:—

The Arrow Rock Machine Shop Co. has been organized at Marshall, Mo.

The Belfast Foundry & Machine Works Co. are being organized at Belfast, Me.

The H. Frank Steel Range Co., of Cleveland, has been chartered with a capital stock of $25 000.

There is talk of a new iron foundry at Henderson, Me., to make castings required for locomotives and cars on the Canadian Pacific Railroad.

The Detroit (Mich.) Combination Tool Co. has been incorporated, capital, $25,000; incorporators, A. J. Greene, W. R. Elliott, H. B. Elliott, John D. Pigott, Edmund Daniel and Robert Sutherland.

C. E. Buek and J. E. Bacon, of Chattanooga, Tenn., and A. B. Peterson, of Chicago, Ill., have recently organized a Frictionless Metal Co., and established friction metal works at Chattanooga, Tenn.

G. G. Zenor, L. C. Keever, C. J. Fulda and others have incorporated the Wilson Sugar Cane Harvester Co., Limited, of Louisville, Ky., to manufacture the Wilson sugar cane harvester machine, etc. The capital stock is $10,000.

L. S. Bent, F. W. Wood, E. C. Felton and others have incorporated at Sparrow's Point, Md., the Maryland Steel Co., of Baltimore county, to manufacture iron and steel, build ships, develop mineral deposits, etc. The capital stock is $1,000,000.

The Elevating Grip & Machine Co. has been incorporated at St. Louis to manufacture elevating machinery and other specialties. The capital stock is $5,000, and the incorporators are Henry Post, Aug. Puff, Jacob Grimm, Thos. Flynn and Theodore Ulschmid.

C. F. Smith, S. N. Jones, H. D. Fitch and others have incorporated the Southern Caloric Light & Fuel Co., of Louisville, Ky., to manufacture the portable and automatic gas machine invented by J. M. Goldsmith, of Chicago, Ill., etc. The capital stock is $50,000.

William B. Sterrit, William J. Sterrit, William E. McMurry, Frank E. Echols and William S. Palsley, of this city, will apply for a charter for an intended corporation to be known as Derwent Foundry Co. They intend to manufacture stoves and light castings.

A tract of 16 acres of land at the junction of the Belt and Illinois Central railways in Illinois, has been purchased by the National Malleable Iron Casting Co. for $40,000. On this property, as a site, it is proposed to erect a plant which will give employment to 600 men.

The Swett Car Wheel Foundry Co. has been formed at Saco, Me. Capital stock, $250,000. The company will manufacture and deal in car wheels and in metal and machinists' works of all kinds. George W. Swett, of Troy, N. Y., is President, and Fred W. Swett, Treasurer.

Messrs. C. J. Kirk, J. P. H Cunningham, David Dickey, of New Castle, Pa., and John Connelly, of New York, will manufacture the Connelly patent gas engine in New Castle. The works will employ about 25 men at the least, but this number probably will be largely increased.

The newly-organized Monongahela Iron & Steel Co., of Pittsburgh, Pa., which concern is building a plant at Hay's Station, near that city, for the manufacture of muck bar, will apply for a charter on August 3. The incorporators are R. A. Carter, Robert G. McKillon, Robert McDonald and Percie Preston and others.

It is reported that preparations are being made for the consolidation of the National Tube Works Co., the Monongahela Furnace Co., Republican Iron Works and Boston Steel & Iron Co. The concern will be reorganized, it is said, under the laws of New Jersey, and will have a capital stock of $11,500,000. This stock is not watered, but represents the value of the various plants. The new concern will be the largest of its kind in the world. The annual output will be $15,000,000.

Additions, Enlargements, Removals, etc.:—

The Winsted Edge Tool Co., Winsted, Conn., is to add new machinery.

An addition will be built this Fall to the works of the Athol Machine Co., at Athol, Mass.

The Alabama Rolling Mills, Gate City, will at once rebuild its finishing department, recently burned.

Fair & Day will, it is stated, put additional machinery in their iron foundry and machine shops at Chattanooga, Tenn.

The machine shops of G. H. Osbourn, at Clarksburg, W. Va., which were reported last week as burned, will be rebuilt at once.

The J. Morton Poole Co., of Wilmington, Del., is erecting a large addition to its machine shops. The addition is 150 x 80 feet, built of iron and brick, with a slate roof, and will be practically fire-proof.

The Champion Shelf Manufacturing Co., Springfield, O., have lately pur-

THE STIRLING COMPANY

MANUFACTURE

The Safest, Most Economical, Compact and Durable High Pressure

WATER TUBE BOILERS.

All Wrought Steel. Large Mud Drum. Perfect Circulation.

By removing four manhole covers access is gained to every part of the boiler. Dry steam and great economy of fuel guaranteed.

GENERAL OFFICE: Pullman Bldg., Chicago. PITTSBURGH OFFICE: Lewis Block. NEW YORK OFFICE: 74 Cortlandt St.

Works: BARBERTON, SUMMIT COUNTY, OHIO.

ROLLS. EST'B. AND 1863 PINIONS.
THE TOTTEN & HOGG IRON & STEEL FOUNDRY CO.
OFFICE & WORKS
24TH ST & A.V.R.R.
PITTSBURGH, PA.
CHILLED & SAND ROLLS
ROCK CRUSHERS,
SHEARS SQUEEZERS AND ROLLING MILL MACHINERY.

MUNN & CO. SCIENTIFIC AMERICAN AGENCY for

PATENTS

A pamphlet of information and abstract of the laws, showing How to Obtain Patents, Caveats, Trade Marks, Copyrights, *sent free.* Address MUNN & CO. 361 Broadway, New York.

THIEVES

Cannot enter your house if you equip it with our PATENT MECHANICAL

ALARM DOOR KNOBS

And Burglar Window Alarms.

The best and cheapest protection to life and property. Cannot get out of order.

ANYONE CAN PUT THEM ON.

All that is necessary is to substitute the Alarm Knob for the old knob inside your door.

SAMPLE BY MAIL, POSTPAID, { ALARM KNOBS, $1.50 / WINDOW ALARMS, .50

Packed in neat boxes with full directions.

The CUYAHOGA MFG. CO., 309 Society for Savings Building, CLEVELAND. O.

☞Liberal discount to the trade.

chased the works of the Victor Manufacturing Co., manufacturers of novelties, and merged the business of the two establishments into one concern. Their line of novelties includes many household necessities.

A representative of Armstrong Bros., manufacturers of boilers at Springfield, O., has secured an option on a large boiler plant at Chicago, Ill. If plans materialize the Springfield plant will probably be moved to Chicago.

The Benjamin Atha & Illingworth Co, steel makers, of Newark, N. J., are erecting a new foundry, which will be equipped with Ridgway cranes. They will be of 28 feet mast, 23 feet radius, 10 feet lift and 6 tons capacity. They expect to have the new foundry in operation in about six weeks.

The capital stock of the Ticonderoga Machine Co., Ticonderoga, N. Y., has been increased from $30,000 to $125,000, and an addition is being built to the old machine shop, which will be 144 x 80 feet. The building will be of brick, and equipped with the most modern machinery for the manufacture of mining machinery and gas engines.

It is reported that A. J Sweeney & Sons, of Wheeling, W. Va., have finally decided to remove their machine works to Staunton, Va. They will operate as the A. J. Sweeney & Sons Co., which company they have incorporated with A J Sweeney as President; J M. Sweeney, Vice-president, and A. T. Sweeney, Secretary, all of Wheeling, W. Va. The capital stock is from $125 000 to $300,000.

The Middleton Car Spring Co., of Philadelphia, is soon to remove its plant to Harvey, Ill., near Chicago, and will occupy a tract of eight acres north of 155th street. This company has a capital stock of $100,000. The officers are: William J. Watson, President; Nathan Middleton, of Philadelphia, Vice-president, and James B. Quirk, Secretary and Treasurer.

General Industrial Notes:—

The Cambria Iron Co., Johnstown, Pa., recently placed in their billet mill a fly-wheel weighing 180,000 pounds.

On the night of the 6th inst., the second turn in the converting department of the Edgar Thomson Steel Works of Carnegie Bros. & Co., Limited, at Braddock, Pa., made 60 heats and turned out 930 tons of steel. The best previous record in one turn was 850 tons.

Anderson, Ind, celebrated the 4th of July by the inauguration of the tinplate industry in that busy town. A number of sheets were manufactured and the works are prepared to turn out fifteen to twenty tons per day. The tin was pronounced to be of the best quality, and the mayor has a number of tin cups made of the first sheet.

Victor Knecht, maker of the Victor coal hod, has united that part of his business with that of The Cincinnati Screw & Tap Co., and these two branches of business, on and after August 1st, will be carried on at the new location, Beekman street, near the C., H. & D. R. R. Co.'s crossing, Cincinnati, O. Mr. Knecht is now President of the Screw & Tap Co. The foundry part of the business will be carried on at the old place, 195 to 203 Wade street.

Hughes & Patterson, of Philadelphia, are just completing what is said to be the finest puddle mill in this or any country. The building is a handsome steel structure, built by Edgemoor Iron & Steel Co., and is about 300 feet square and 40 feet high. It contains 20 puddle furnaces, a rotary squeezer of improved pattern, and two sets of three-high muck rolls in a single train. For handling the finished bars, the Ridgway system of steam hydraulics has been adopted. One of these cranes will carry a Dennison patent weighing machine, and with it one man will weigh up, record and load the entire product of the mill.

Lake Chautauqua, the Queen of Summer Resorts

At a lake of cool crystal water, located among the beautiful highlands of the Empire State, 150,000 people seek each Summer season the delightful rest always found in that wholesome atmosphere. Chautauqua: the famous resort! located between 1,400 and 1,500 feet above the ocean, whose facilities for boating, fishing and bathing are unsurpassed, and combine these pastimes with the advantages made possible through the educational and religous organizations, which make Chautauqua Lake their Summer headquarters, is it suprising that each season, thousands frequent its shores?

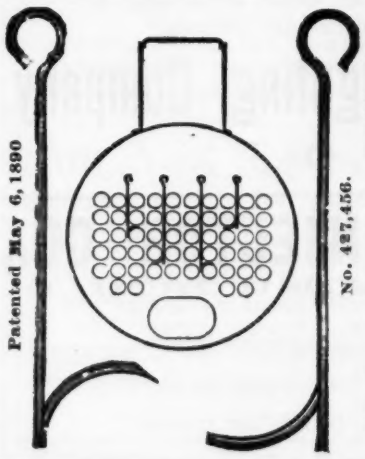
With hotel accommodations capable of delighting the tastes of the most fastidious, and boarding houses where families may secure commodious rooms and excellent service at reasonable rates, should it be wondered at that people flock from the smoke, dust and heat of our cities to enjoy the pleasures and benefits obtainable on the shores of this lake of springs.

Tourists selecting the Nickel Plate route to this queen of Summer resorts will find accommodations desirable in every appointment. Excellent connection is made for Chautauqua Lake, at Brocton Junction, N. Y., and from Mayville, N. Y., any point on the lake may be reached via boat or rail. Passengers holding tickets via the Nickel Plate to Niagara Falls, may secure stop-over at Chautauqua free of charge.

Be sure your tickets read via the Nickel Plate.

Tempering Tools

The following is said to be the Swiss method of hardening cast steel for cutting tools. Mix in a suitable vessel four parts of pulverized resin and two parts of train oil. Stir well in this one part hot tallow. Into this mixture the article to be hardened is plunged at a low red heat and held there until thoroughly cooled. Without cleaning off the piece is again put into the fire and suitably tempered in the ordinary way. An examination of steel thus hardened indicates that the hardening is deeper and more uniformly distributed than is commonly the case, and that the steel is less brittle. Articles thus hardened have excellent and durable cutting qualities.



TO USERS OF TUBULAR

BOILERS

Why you should use Bauer's External Flue Scraper, as it is the only known device that removes the scale and sediment from the outside of the flues.

B 1st. Removes scale from the external surface of the flues.
E 2d. Saves flues from collapsing and overheating.
C 3d Gives absolute protection to flues from scaling.
A 4th. By removing this scale from the flues and boiler head, saves flues, extra fuel and repairs.
U 5th It will save its price the first time it is used.
S 6th. A set should be in the hands every engineer.
E 7th. Price $10 a set of 5 pieces, are sent on 30 days' trial. Send outside diameter of flues.

Send for circular of both the Scraper and of our Sensible Automatic Packing.

Sensible Automatic Packing Co., 63 South Canal St. CHICAGO ILL.

L. H. OLDFIELD.

Merchandise Broker.

Correspondence Solicited.

WICHITA, KANSAS.

Keep a Record of Your Insurance

By ordering one of our Improved

Expiration Registers.

Blanks for all the essential points of each policy.

ONLY 50 CENTS (Postage paid).

Will last for years. Sample leaves sent on application. Address

The Cleveland Printing & Publishing Co.

27, 29 and 31 Vincent Street, CLEVELAND, O.

BOSTWICK PATENT.

A great saving in mortar, material and labor Write for Catalogue and Sample.

THE BOSTWICK STEEL LATH CO., 38 Park Row, New York City Niles, O.

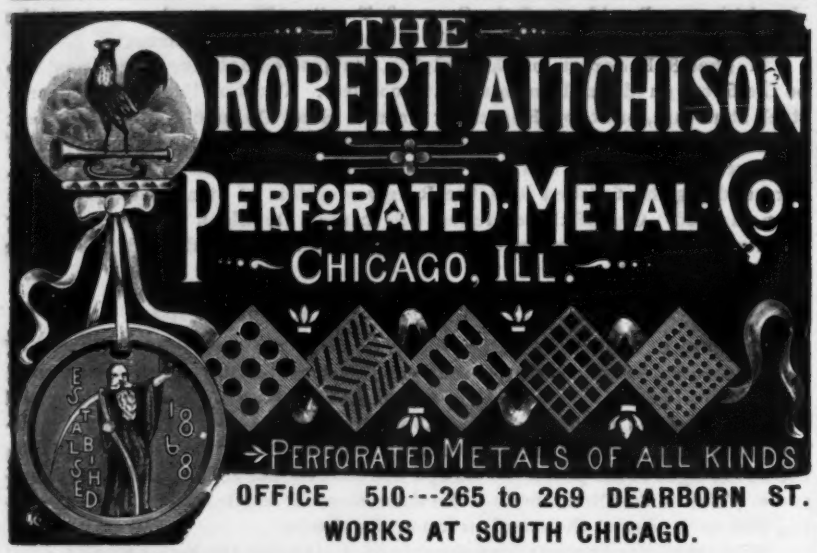
Mention this Paper.

Patent Milled or Turned Shafting

Is rapidly coming to the front. Made only by

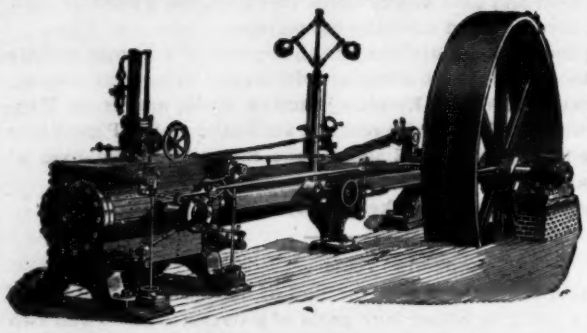
The Brightman Machine Co.

CENTER ST. FROM MAIN TO WINSLOW, CLEVELAND, O.



OFFICE 510---265 to 269 DEARBORN ST.
WORKS AT SOUTH CHICAGO.

- MACHINERY. -



Iron and Wood Working Machinery of every description; Corliss Engines and Boilers; Shafting, Pulleys and Hangers.

Agent for Bement Miles & Co., Philadelphia, and Eastern Agent for J. A. Fay & Co.

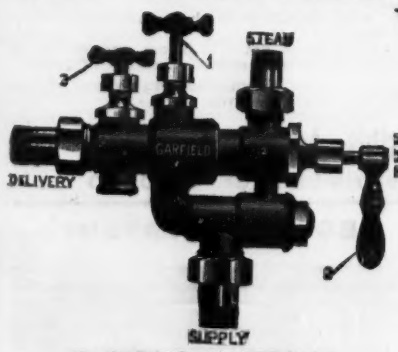
GEO. PLACE,
ESTABLISHED 1855
120 BROADWAY, N. Y.

HAS YOUR WAREROOM
BEEN ROBBED?

Our corrugated or plain Iron or Steel SHUTTERS and DOORS will render it Fire and Burglar Proof. We also cover wooden shutters and doors with flat painted sheets, either plain or with corduroy corrugations. For prices, etc., address

The Cincinnati Corrugating Company,
BOX 320. PIQUA, O.

THE GARFIELD INJECTOR CO.,
WADSWORTH, O.,
—MANUFACTURERS OF—



The Garfield Double Jet Injector.

THE GARFIELD
Locomotive Injector,
Automatic Injector,
Double Jet Injector
AND
Ejector.

Strong, Carlisle & Turney,
General Agents,
CLEVELAND, O.

DIXON'S GRAPHITE PAINT

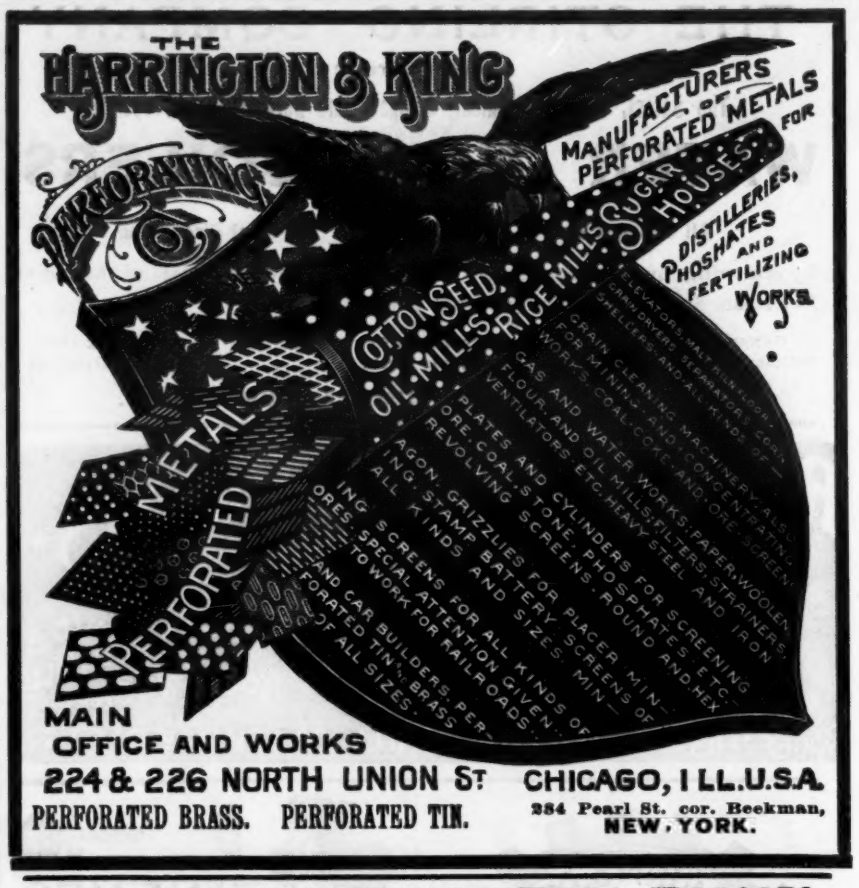
THOSE who use it say that one pound will cover 2 to 3 times more surface and last 4 to 5 times longer than any lead, mineral or metallic paint. A tin or iron roof well painted will not require repainting for 10 to 15 years.

JOS. DIXON CRUCIBLE CO.,
Jersey City, N. J.

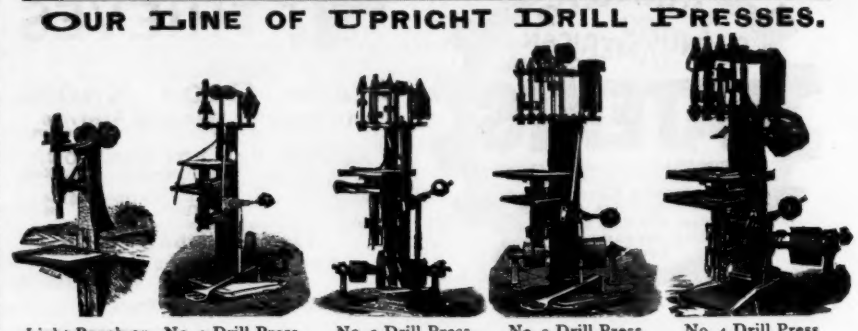
FOR SALE.

1 $250 BOND - First-Class Security.

Bearing 8 per cent., payable semi-annually.
WANT TO REALIZE AT ONCE. ADDRESS,
W. N. C.,
Room 1, 29 Euclid Ave., CLEVELAND, O.


THE
HARRINGTON & KING
PERFORATING
MANUFACTURERS OF PERFORATED METALS FOR
SUGAR HOUSES,
DISTILLERIES,
PHOSPHATES AND FERTILIZING WORKS
COTTON SEED OIL MILLS
RICE MILLS
PERFORATED METALS
ELEVATORS, MASTICATORS, GRAIN DRYERS, SEPARATORS, SCALES, SHELLERS AND ALL KINDS OF GRAIN CLEANING MACHINERY ALSO FOR MINING AND CONCENTRATING WORKS, COAL, COKE AND ORE SCREENS
GAS AND WATER WORKS, PAPER, WOOLEN, FLOUR AND OIL MILLS, FILTERS, STRAINERS, VENTILATORS, ETC. HEAVY STEEL AND IRON PLATES AND CYLINDERS FOR SCREENING ORE, COAL, STONE, PHOSPHATES, ETC. REVOLVING SCREENS, ROUND AND HEX AGON, GRIZZLIES FOR PLACER MINING, STAMP BATTERY SCREENS OF ALL KINDS AND SIZES, MINING SCREENS FOR ALL KINDS OF ORES, SPECIAL ATTENTION GIVEN AND CAR BUILDERS PERFORATED TIN, BRASS OF ALL SIZES, TO WORK FOR RAILROADS
MAIN OFFICE AND WORKS
224 & 226 NORTH UNION St CHICAGO, ILL. U.S.A.
PERFORATED BRASS. PERFORATED TIN.
284 Pearl St. cor. Beekman, NEW YORK.

OUR LINE OF UPRIGHT DRILL PRESSES.


Light Bench or Post Drill. | No. 1 Drill Press. 1 or 2 Spindles. | No. 2 Drill Press. | No. 3 Drill Press. | No. 4 Drill Press.

THE GARVIN MACHINE COMPANY
Manufacturers of, and Dealers in, all kinds of
Machinery and Machine Tools.

Universal and Plain Milling Machines, Drill Presses, Screw Machines, Hand and Engine Lathes, Planers, Profilers, Chucking Machines, Gear Cutters, Die and Cutter Grinders, Tapping Machines, Wire-Spring Coilers, Milling Cutters, etc.

Plants for Manufacturers of Sewing Machines and Electrical Goods.
GEAR CUTTING AND MILLING IN ALL ITS BRANCHES.
Laight & Canal Sts., [Catalogue sent on Application] NEW YORK.

COPELAND & BACON.
HOISTING & WINDING ENGINES
ORE CRUSHERS, ORE WASHERS, CONCENTRATING MACHINERY, GRAVITY INCLINES, STONE CRUSHERS, RAILROAD CRANES.
85 LIBERTY ST., NEW YORK. 555 ARCH ST., PHILADELPHIA

S. T. W. Ejector.

For Raising Water from Deep Wells, Streams, Excavations, &c.
The cheapest made. Send for prices
JAMES JENKS,
Manufacturer,
DETROIT, MICH.
M. P. SATTERTHWAITE, Agt., Cleveland, O.

Plate Iron Washers
A SPECIALTY!
Even in Gauge, smooth and well finished.
Cut from new plate, rolled expressly for the purpose. Write for prices, Address,
MILTON MFG. CO., Milton, Pa.

The Wock Patent Slip Joint Eaves Trough, 10 ft. 2 in. Long, Without a Seam.

Steel and Wire Hangers, Etc.

THE BELDING PATENT LOCK SLIP JOINT TROUGH, Manufactured by **THE CANTON STEEL ROOFING CO., Canton, O.**

IRON AND STEEL MARKETS.

PIG IRON.

CLEVELAND (f. o. b. cars, net cash) Bessemer, $17 30; No. 1 Foundry, $16 80; No. 2 Foundry, $15 80; No. 1 Gray Forge, red short, $14 80; No. 2 Gray Forge, neutral, $14 30; No. 1 American Scotch, $16 80; No. 2 American Scotch, $15 80.

CHICAGO (reported by Messrs. Rogers, Brown & Merwin): Southern Coke No. 1 foundry, $16 25@17 00; Southern Coke No. 2 Foundry, $15 25@16 00; Southern Coke No. 3 Foundry, $14 75@15 50; Southern Coke No 1, Softeners, $15 25@16 00; Southern Coke No. 2, Softeners, $14 50@15 25; Ohio Silveries No. 1, $17 50@18 50; Ohio Silveries No. 2, $16 50@17 50; Ohio Strong Softeners No. 1, $18 00@19 00; Ohio Strong Softeners No. 2, $17 25@18 25; Lake Superior Charcoal Nos. 1 to 6, $17 75@18 50; Tennessee Charcoal No. 1, $18 00@19 00; Tennessee Charcoal No. 2, $17 00@18 00; Southern Standard Car Wheel, $21 00@23 00; Tennessee Standard Car Wheel, $00 00@00 00.

CINCINNATI (reported by Rogers, Brown & Co.). FOUNDRY IRONS—Southern Coke, No. 1 foundry, $15 00@15 25; Southern coke, No. 2 and No. 1 soft, $13 75@$14 25; Hanging Rock Coke, No. 1 foundry, $16 50@17 50; Jackson Co. Stone Coal, No. 1 foundry, $16 50@17 00; Tennessee Charcoal, No. 1 foundry, $16 50@17 50; Hanging Rock Charcoal, No. 1 foundry, $20 00@22 00. MILL IRONS—Standard Southern Coke, grey forge, $12 75@13 25; Standard Southern Coke, mottled, $12 25@12 75; Cold Short Southern Coke, grey forge, $12 75@13 00; Strong Ohio Neutral Coke, grey forge, $15 00@15 50. CAR WHEEL AND MALLEABLE—Standard Alabama Car Wheel, $19 50@20 50; Tennessee Car Wheel, $18 00@19 00; Lake Superior Car Wheel, $19 50@20 50.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $17 00@00 00; Mahoning and Shenango Valley strong, No. 2 Foundry, $16 00@00 00; Ohio Softener No. 1, $17 00@00 00; Ohio softener No. 2, $16 00@00 00; Jackson Co., Silvery No. 1, $18 25@00 00; Jackson Co. Silvery, No. 2, $17 25@00 00; Lake Superior Charcoal, $18 00@00 00; Tennessee Charcoal, $18 00@19 00; Southern Softener No. 1, $16 25@00 00; Southern Softener No. 2, $15 50@00 00; Southern Strong No. 1 Foundry, $17 00@00 00; Southern Strong No. 2 Foundry, $16 25@00 00; Alabama Car Wheel, $22 00@22 50; Hanging Rock Charcoal, $23 00@24 00.

LOUISVILLE (reported by Hall Bros. & Co.). HOT BLAST FOUNDRY—Southern coke No. 1, $14 50@15 00; Southern coke No. 2, $13 75@14 25; Southern coke No. 3, $13 25@13 50; Mahoning Valley (Lake ore mixtures), $00 00@00 00; Southern charcoal, No. 1, $16 50@17 00; Southern charcoal, No. 2, $16 00@16 50; Missouri charcoal, No. 1, $17 00@17 50; Missouri charcoal, No. 2, $16 50@17 00. FORGE—Neutral coke, $12 50@13 00; Cold short, $12 50@13 00; Mottled, $12 00@12 25. CAR WHEEL AND MALLEABLE—Southern (standard brands), $19 50@20 00; Southern (other brands), $17 50@18 00; Lake Superior, $20 50@21 50.

ST. LOUIS (reported by Rogers, Brown & Meacham): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $15 50@15 75; Southern Coke No. 2, $14 75@15 00; Southern Coke No. 3, $14 00@14 25; Southern Grey Forge, $13 50@13 75; Southern Charcoal No. 1, $17 75@18 00; Southern Charcoal No. 2, $17 25@17 50; Missouri Charcoal No. 1, $15 50@16 00; Missouri Charcoal No. 2, $15 00@15 50; Ohio Softeners, $18 00@19 50. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $20 00@20 50; Southern, $19 00@21 00. CONNELLSVILLE COKE—East St. Louis, $0 00; St. Louis, $0 00.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $18 00@18 50; Lake Superior (coke) Bessemer, $17 75@18 25; Katahdin (Maine charcoal), $00 00@00 00; Lake Superior Coke, Foundry, all ore, $17 50@18 00; Lake Superior Coke, Foundry, all ore, $00 00@00 00; Standard Ohio Black Band, $18 00@18 25; Southern No. 1 $16 25@16 50; Southern Gray Forge, $14 00@14 50, Jackson County (Ohio) Silvery, $18 00@18 50; Old Car Wheel, $00 00@00 00. Connellsville Coke, $0.00.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry $14 50@15 00; Southern Coke No. 2 Foundry $13 75@14 25; Southern Coke No. 3 Foundry $13 25@13 75; Grey Forge, $12 75@13 25; Southern Coke Silver Grey, $00 00@00 00; Southern Charcoal No. 1 Foundry, $16 00@17 00; Car Wheel, $18 00@20 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $16 00@16 50; No. 2 Foundry, $15 00@15 50; Grey Forge, $14 00@14 25; White and Motlled, $13 00@13 50; Warm Blast Charcoal, $18 00@20 00; Cold Blast Charcoal, $22 00@27 00; Bessemer, $16 50@16 75.

MERCHANT IRON AND STEEL.

Flat Bar

1½ to 4 by ⅜ to 1 inch	1 80
4½ to 6 by ⅜ to 1 inch	1 90
1½ to 6 by 1⅛ to 2 inch	2 20
1¼ & 1¾ by ⅜ to ½ inch	1 90
1 & 1¼ by ⅜ to ½ inch	2 00
⅝, ¾ and ⅞ by ⅜ to ½ inch	2 20

Round and Square.

1 to 1⅛ inch	1 80
2 to 2⅛ inch	2 00
2¼ to 3½ inch	2 30
3⅛ to 4 inch	2 80
4¼ to 4½ inch	3 30
4¾ to 5 inch	3 50

Oval.

⅝ to 1¼ inch	2 20
⅞ to ¾ inch	2 40
⅝	2 60
¾	3 00

Half Oval and Half Round.

1¼ to 3 inch	2 90
⅞ to 1¼ inch	2 50
⅞ to ¾ inch	3 10
⅝	3 30
½	4 80

Heavy Band.

¼ to 6 by ¼ and 5-16 inch	2 00
¼ to 1⅜ by ¼ and 5-16 inch	2 10
¼ to ¾ by ¼ and 5-16 inch	2 30
to 4 by ¼ and 5-16 inch	3 80

Hoops.

1¼ to 4, Nos. 13 to 15	2 60
1¼ to 3, Nos. 16 to 18	2 70
1¼ to 2, No. 19	2 80
1¼ to 2, No. 20	2 90
1¼ to 2, No. 21	3 00
1¼ to 2, No. 22	3 10
15-16, 1 and 1⅛, Nos. 13 to 15	2 80
15-16, 1 and 1⅛, Nos. 16 to 18	2 90
15-16, 1 and 1⅛, Nos. 19 and 20	3 00
15-16, 1 and 1⅛, No. 21	3 10
15-16, 1 and 1⅛, No. 22	3 20
⅞, Nos. 13 to 15	3 00
⅞, Nos. 16 to 18	3 10
⅞, Nos. 19 and 20	3 20
⅞, No. 21	3 30
⅞, No. 22	3 40
13-16, Nos. 13 to 15	3 20
13-16, Nos. 16 to 18	3 30
13-16, Nos. 19 and 20	3 40
13-16, No. 21	3 50
13-16, No. 22	3 60
¾, Nos. 13 to 15	3 30
¾, Nos. 16 to 18	3 50
¾, Nos. 19 and 20	3 60
¾, No. 21	3 70
¾, No. 22	3 80
11-16, Nos. 13 to 15	3 50
11-16, Nos. 16 to 18	3 70
11-16, Nos. 19 and 20	3 80
11-16, No. 21	3 90
11-16, No. 22	4 00
⅝, Nos. 13 to 15	3 80
⅝, Nos. 16 to 18	4 00
⅝, Nos. 19 and 20	4 10
⅝, No. 21	4 20
⅝, No. 22	4 30
⅝, No. 23	4 50

Light Band.

1¼ to 6 by ⅛ to 3-16 in	2 20
1¼ to 6 by Nos. 11 and 12	2 30
1 to 1¾ by ⅛ to 3-16 in	2 40
1 to 1¾ by Nos. 11 and 12	2 50
⅞ and 13-16 by ⅛ to 3-16 in	2 70
⅞ and 13-16 by Nos. 11 and 12	2 80
¾ and 11-16 by ⅛ to 3-16 in	3 00
¾ and 11-16 by Nos. 11 and 12	3 10
⅝ and 9-16 by ⅛ to 3-16 in	3 30
⅝ and 9-16 by Nos. 11 and 12	3 40
½ by ⅛ to 3-16 in	3 60
½ by Nos. 11 and 12	3 70

Wagon Box Iron.

⅝ inch, beveled edge, by Nos. 11 and 12	2 80
⅝ inch, " " " 13 and 14	3 00
¾ inch, " " " 11 and 12	3 10
¾ inch, " " " 13 and 14	3 30

Sheet Iron.

No. 10 to 14	2 65
No. 15 to 17	2 75
No. 18 to 21	2 99
No. 22 to 24	3 15
No. 25 to 26	3 30
No. 27	3 40
No. 28	3 50

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 60
C No. 1, " "	2 85
C H No. 1 " "	3 10
C H Flange, " "	3 85
Extra Flange, "	4 35
Solid Fire Box "	5 10

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 75
Shell	3 15
Flange	3 45
Marine Flange	3 85
Fire Box	4 55

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c lb extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1¼c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs
1 to 2 in. inclusive	09
9-16 to ⅞ in "	09
7-16 to ⅝ and 2⅛ to 3 in	10⅛
3⅛ to 4 in	11
⅞ to 11-16 and 4⅛	10⅛
⅛ to 6 in	11⅛
¼ to 9-32 and 6⅛ to 7 in	12
3-6 in	14

Flats.

	cts. lbs
2 to 9-16 wide by 2 to ⅝ thick	9

Bessemer and O. H. Steel.

Machinery	base price,	2 75
Tire	"	2 75
Spring	"	3 25
Sleigh Shoe	"	2 75
Toe Calk	"	3 00
Cutter Shoes, tapered and burr.	"	3 00

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	15c

Burden Boiler Rivets.

⅜, ½, 11-16 and ⅝ inches diameter	4 00
Bridge ⅜, ½, 11-16 and ⅝ inch diam	4 00

SCRAP IRON AND OLD METAL.

	NET TONS
No. 1 R. R. wrought scrap	$18 00
No. 1 wrought scrap	16 50
No. 1 Machine cast scrap	11 50
Iron axles	23 50
Axle turnings	13 50
Wrought turning (free from cast)	11 50
Cast borings	8 00
Uncut wrought iron boilers	11 50
Steel boiler plates	16 00
Grate Bars	8 00
Pipes and flues (Clean)	12 00
Tank iron	12 50
Hoop and band iron	9 50
Sheet iron	8 50
Wrought drillings	11 00
Malleable iron	9 50

Reported by Messrs. BLACK & POLLOCK, Cincinnati, O.:

Railroad Wrought	$20 00
No. 1 Country Wrought	17 00
Stove Plate	8 75
Machine Castings	11 00
Hoop and Sheet	8 00
Casting Borings	9 00
Wrought Turnings	12 00

CLEVELAND ROLLING MILL CO.,

MANUFACTURERS OF

BESSEMER STEEL RAILS,

Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel, Steel Street Rails, Steel Oil Barrel Hoops, Wire of all Kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

THE CAMBRIDGE IRON & STEEL CO.

MANUFACTURERS OF

SHEET IRON AND SHEET STEEL

CAMBRIDGE REFINED IRON. TRADE MARK

Squared Roofing Sheets a Specialty

CAPACITY RANGES FROM No. 30 26 INCHES WIDE TO 1-4×40-120

CAMBRIDGE SOFT STEEL. TRADE MARK

CORRESPONDENCE SOLICITED

OFFICE AND WORKS CAMBRIDGE, OHIO.

Magnetic Concentration of Iron Ore.

Ball-Norton (Monarch) Electro Magnetic Separator.

Phosphorus, sulphur, silica, hornblende and other impurities eliminated from Iron Ore, and non-Bessemer ore converted into Bessemer Ore. Samples treated without charge. Correspondence solicited.

H. E. COLLINS & CO., Agents Magnetic Separator Co.,

BANK OF COMMERCE BUILDING, PITTSBURGH, PA. ALDRICH COURT, 45 BROADWAY, NEW YORK

DALLIBA, CORRIGAN & CO.,

DEALERS IN

Iron Ore & Pig Iron,

Rooms 716, 717, 718, 719 Perry-Payne Bld'g.

CLEVELAND, O.

OGLEBAY, NORTON & CO.,

Successors to Tuttle, Oglebay & Co.,

Commission Dealers in

Iron - Ores,

FROM MARQUETTE, GOGEBIC AND MENOMINEE DISTRICTS,

CLEVELAND, OHIO.

J. H. OUTHWAITE. W. G. POLLOCK.

J. H. OUTHWAITE & CO.,

Exclusive attention given to

LAKE SUPERIOR AND MENOMINEE RANGE

Iron Ore,

Perry-Payne B'ld'g. Cleveland, O.

THE CONDIT-FULLER CO.,

Pig and Bar Iron,

CLEVELAND, OHIO.

E. C. POPE,

COMMISSION DEALER IN

Iron Ore, Pig Iron

AND METALS.

Cleveland, - Ohio.

Sam'l. L. Matner, Prest. & Treas. Fred. A. Morse, Sec'y.

Cleveland Iron Mining Co.,

Dealers in Iron Ores

from their own mines near Marquette, Lake Superior.

Rooms 4 & 5 Mercantile Bank Building,

CLEVELAND, O.

PITTSBURGH & WHEELING COAL CO.,

MINERS AND SHIPPERS OF

Ohio Steam Coal and Coke.

Mines on the Cleveland, Lorain & Wheeling R. R. Capacity, 3,000 tons daily.

Office, 6 Mercantile Bank Building,

CLEVELAND, OHIO.

Lake Shipping Point, Lorain O.

JAS. PATTERSON, Sales Agent.

ESTABLISHED 1854.

PETER GERLACH & CO.,

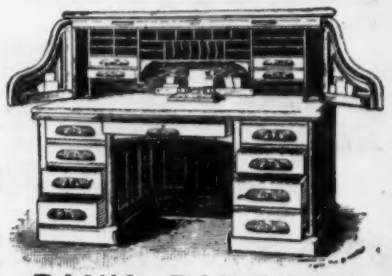
MAKERS OF

Saws, Tools and Machinery.

Office and Warerooms, 28 Columbus st. Factories on Columbus, Winter and Leonard streets.

Cleveland, O., U. S. A.

DESKS.



BANK, RAILROAD

—AND—

OFFICE FURNITURE.

Interior Work a Specialty.

Send for Illustrated Catalogue.

THE CLEVELAND DESK CO.

97-99 Ontario St., Cleveland, Ohio.

MACHINERY SUPPLY MARKET.

Anvils.

American.....₩ lb 9@10
Wrights.....₩ lb 12

Bellows.

Blacksmiths' { Hill's.....dis 40
Bullock's.....dis 50&10
Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

Belting.

Boston Belting Co's standard.....dis 70
" " " extra.....dis 60&5
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard..dis 60&10
Shultz Raw Hide Leather Belting, single, ...dis 40
Shultz Raw Hide Leather Belting, double and Light Double.....dis 40
Standard, oak tanned.....dis 50&10
Alexander Brothers' pure oak tanned. ...dis 45

Blowers and Exhausters.

B. F. Sturtevant's.....dis 20
Boston Blower Co.....dis 35
Buffalo.....dis 35

Borax.

.....₩ lb 12

Chalk.

White.....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 85

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers.....dis 30
" Drill.....dis 35
Wescott's Scroll Combination.....dis 33⅓
" Independent.....dis 40
" Little Giant Drill.....dis 30
Horton's Universal.....dis 40
" Independent.....dis 45
Whiton's Independent.....dis 45
National Combination.....dis 40
Sweetland " .....dis 40
Almond Drill.....dis 20
Morse " .....dis 15
Skinner's Combination Lathe.....dis 33⅓
" Independent Lathe.....dis 40
" Universal Lathe.....dis 40
" Drill.....dis 15

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
" Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3¼

Drill and Drill Sockets.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1¼".....dis 50&10
Morse Taper and Straight shank Larger than 1¼".....dis 25
Drill Sockets.....dis 25
Standard Twist Drills.....dis 55@55&5
Cleveland " " .....dis 55@55&5

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. F. FF.
Kegs, ₩ lb	4 c	5 c		2¾c
¼ kegs ₩ lb	4¼c	5¼c		2¾c
¼ kegs ₩ lb	4¼c	5¼c		3 c
10 lb cans, 10 in case	6 c	6¼c		5 c
10 lb cans, less than 1	10 c	10 c		7¼c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 45@50
H. H. Barton.....dis 50@50&10

Emery Wheels.

Detroit.....dis 55@60
Norton's.....dis 55@60
Grant.....dis 55@60
Sterling.....dis 60
Celluloid.....dis 10&33⅓
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60
Vulcanite.....dis 10&10

Files.

Nicholson.....dis 60&10@60&10&10
" "X. F.".....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
ndustry File Works, hand cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	⅜	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3⅛
Hexagon	13½	11½	8½	6	5½	5⅛	5
Washers	9	8	7	5	4½	4⅛	4⅛

In lots less than 100 lbs, ₩ lb add ½c., 1lb boxes add 1c to list.

Nails (wire.

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate { Car lots.....$2.30 { Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $5.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 13@14
Plumbago Piston.....₩ lb 40
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 50
Sheet Rubber.....₩ lb 12&24
Excelsior Rubber.....₩ lb 48

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 50@55

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ½ inch and over.....₩ lb 15½
Sisal, ½ inch and over .....₩ lb 13½

Sand Paper.

B. A. & Co.....dis 45@50
H. H. Barton's.....dis 40@45
New England Flint.....dis 40@50
Barton's Garnet.....dis 20

Saws.

Disston's Circular.....dis 40@10
" Band.....dis 20
" Scroll .....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 37
Atkins' Circular Saws.....dis 40&45
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 32c "
No. 1 Handles.....dis 23c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay .....dis 45

Screws.

Wood Screws—New List 1890.

Flat head iron.....dis 72½
Round head iron.....dis 67½
Flat head brass.....dis 72½
Round head brass.....dis 65
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 65
Machine, round head, iron.....dis 60
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2¾ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ⅛ lb Balls	21c@29c	
No. 18 " " ¼ and ⅛ "	18c@28c	
No. 36 " " ¼ and ⅛ "	16c@27c	
2-Ply Hemp, ¼ & ⅛ lb Balls (Spring Twine)	11½c	
3-Ply " 1lb Balls	12@12½c	
3-Ply " 1¼ lb Balls	11@11½c	
Cotton Wrapping, 5 Balls to lb	15@16c	

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 25

Wire.

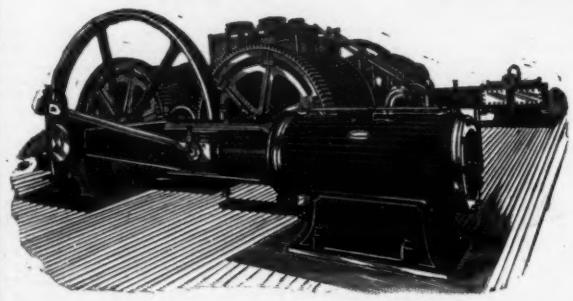
New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75&5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " "..dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire, regular.....$6.00 ₩ lb dis 3

Wrenches.

Coe's genuine, ...dis 30
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10,& 3
Bemis & Call's Combination .....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 25
William's " " .....dis 25
Alligator " " .....dis 50

Webster, Camp & Lane Machine Co.



MANUFACTURERS OF

Mining Machinery,

Improved Band Friction Hoisting Machinery, Geared or Direct Acting, for round or flat rope.

Wire Rope Haulage Machinery,

Endless or Tail Rope Systems.)

CORNISH PLUNGER AND BUCKET LIFT PUMPS.

Automatic or Slide Valve Steam Engines, Sheaves. Cages, Buckets, Etc.

Send for Catalogue D. 134 N. Main St., AKRON, OHIO.

TIME IS MONEY!

SAVE TIME AND MONEY BY USING OUR SPECIALTIES.

OUR **Time Stamps**

Mark the hour and minute, the day, month and year, by one impression.

Useful, Economical, Ornamental.

PRINTED MATTER ON APPLICATION.

OUR **Time Registers**

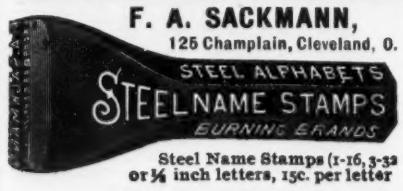
Record the hour and minute of the arrival and departure of employes by their own act, in their own handwriting.

Indispensable for employers and just to employes.

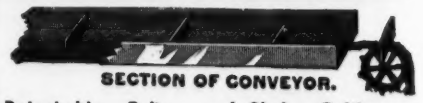
THE AUTOMATIC TIME STAMP AND REGISTER COMPANY

No. 71 Sudbury St., Boston, Mass., U. S. A.

THE THOS. D. WEST FOUNDRY. CO.
CLEVELAND. O.
LIGHT AND HEAVY
IRON. CASTINGS.
DAILY MELTING CAPACITY 75 TONS-SPECIAL FACILITIES FOR ECONOMICALY TURNING OUT SMOOTH CLEAN CASTINGS.
DUPLICATE WORK A SPECIALTY



F. A. SACKMANN,
125 Champlain, Cleveland, O.
Steel Name Stamps (1-16, 3-32 or ¼ inch letters, 15c. per letter



SECTION OF CONVEYOR.

Detachable Roller and Chain Belting,

MADE IN ALL SIZES OF

Malleable Iron and Steel,

DESIGNED FOR

Elevators, Conveyors, Drive Belts, etc.

For handling materials of all kinds.

Send for Illustrated Catalogue. Address

The Jeffrey M'f'g Co.,

183 East 1st Ave.,

COLUMBUS, O.

Chicago Office, 48 S. Canal St.

Eastlake Metallic Shingles.

Unequaled for

ROOFING AND SIDING.

Manufactured by

W. J. BURTON & CO.'s

Galvanized Iron Cornice Works,

Detroit, Mich.

Send for illustrated catalogue and prices.

Mention this paper.

UNION ELECTROTYPE FOUNDRY
TELEPHONE 2139
829 SHERIFF ST. CLEVELAND O.

THE INDISPENSABLE LATHE DOG.

THE INDISPENSABLE LATHE DOGS can be attached to work after the work is centered in the lathe. They can be used equally as well BETWEEN COLLARS as upon plain or straight work.

DROP FORGED FROM BAR STEEL.

No. 1 takes from ¼ to 1¼ inches, price, each.....$1 50
" 2 " ½ to 2¼ " " 2 50
" 3 " 1 to 3¼ " " 3 50
Price, per set of three, to take from ¼ to 3¼ in. 7 50

PALMER, CUNNINGHAM & CO., L't'd,
607 Market St., PHILADELPHIA, PA.

IRON FOUNDRY CANTON IRON FOUNDRY CO.,
Canton, Ohio.
HEAVY AND LIGHT CASTINGS.
Privilege to make estimates solicited.

THE BRIGHTMAN STOKER IS THE BEST
STEAM BOILER FURNACE IN THE WORLD.
SEND FOR DESCRIPTIVE PAMPHLET. THE BRIGHTMAN STOKER Co. 201-203 RIVER ST. CLEVELAND, OHIO.

HARDWARE MARKET.

Augers and Bits.

Common augers and bits.....dis 70
Snell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ℔ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ℔ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $3 25@4 00
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....℔ doz $7 00
Others.....℔ doz $6 00
Full polished.....℔ doz $8 00

Bolts.

Cast iron barrel bolts.....dis 70
Cast iron shutter bolts, etc.....dis 70
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70
Wrought iron square bolts.....dis 70
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 75&10
Tire, common, new list.....dis 65
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 60
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 75&10
Cast brass, loose joint.....dis 33⅓
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60
Fast joint, broad.....dis 50&10@60
Loose joint.....dis 70&10
Loose joint, jap.....dis 70&10
Loose joint, jap. with acorns.....dis 70&10
Loose pin, acorns.....dis 70&10
Loose pin, japanned acorns.....dis 70&10
Loose pin, acorns, jap. plated tips.....dis 70&10
Wrought steel—
Wrought, fast joint, narrow.....dis 70&10
Wrought, fast joint, broad.....dis 70&10
Wrought, loose joint, broad.....dis 70&10
Table Butts, back flaps, etc.....dis 70&10
Regular inside blind.....dis 70&10
Light inside blind.....dis 70&10
Loose pin.....dis 70&10
Light loose pin.....dis 70&10

Carbonized Felt and Building Papers.

(POWERVILLE BRAND.)

	Per roll of 500 sq. feet.
Eberts Bros., Detroit.	
No. 1—Slaters'.....	$1.25
"A," Stringed Roofing, Light.....	1.50
"B," Stringed Roofing, Medium.....	1.75
"C," Stringed Roofing, Heavy.....	2.00
Stringed, Rosin-Sized.....	1.00

MISCELLANEOUS.

Asphaltum, Trinidad Refined, ℔ ton.....	$30.00
Asphaltum, Fine Grade, ℔ lb.....	.08
Coal Tar Felt, 1 Ply, ℔ lb.....	.02
Coal Tar Felt, 2 Ply, ℔ roll 108 sq ft.....	1.42½
Coal Tar Felt, 3 Ply, ℔ roll 108 sq ft.....	1.85
Roofing Pitch, ℔ gal.....	.09

Chains.

Revised List.
Trace, 6¼-10-2.....℔ pair 1.03
Trace, 6¼-10-3.....℔ pair .92 } .....50&10
Trace, 7-10-2.....℔ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887.....dis 50&10@60
Galvanized Pump Chain.....℔ lb 5½@6
Jack Chain, Iron.....dis 75&10
Jack Chain, Brass.....dis 75

Chisels.

Socket Framing and Firmer.....dis 75
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Fibre Ware—Standard.

	Nos. 1	5.	5X.
Pails, water, 12 qt.....	$4 00	$4 50	$.....
Dairy, 14 qt.....	4 50	5 00	.....
Fire 12 qt.....	5 00	.....	.....
Sugar.....	6 00	6 50	.....
Horse.....	.....	5 00	.....
Buggy.....	4 00	.....	.....
Chamber slop Commode } 5 and 5X 14 qt.....	6 50	7 50	8 50
3 qt. slop, 5 and 5X 14 qt.....	8 00	9 00	10 00
Basins, wash—			
10½ inch.....	2 00	2 25	.....
12 inch.....	2 25	2 75	3 25
13½ inch.....	2 75	3 25	3 75
15 inch.....	3 25	3 75	4 25
Bowls, fruit.....	.....	2 50	.....
Servers, 12 in.....	.....	2 25	.....
Baskets, waste paper, 13 in.....	.....	6 00	.....
Spittons, "Daisy," pressed			
8 inch.....	4 00	4 50	5 00
10 and 11¾ inch.....	6 00	6 50	7 50

No. 1 plain; No. 5 decorated; No. 5X White decorated.

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....℔ gross $12, dis 25@25&5

Hanger

Barn door, old patterns.....dis 60&10&10@70
Climax, (Anti-Friction).....dis 55
Scranton.....dis 33—
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 40&10
Richard's.....dis 30@30&10

Horse Nails.

No.	10	9	8	7	6	
Ausable, ℔ lb.	23	24	25	26	28	dis 40
Putnam, ℔ lb.	18	19	20	21	23	dis 15
Essex						dis 25&10

Horse Shoes.

Burden, at factory.....℔ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....℔ keg $4 00
Mule Shoes, at factory.....℔ keg $5 00

Knobs.

Carriage, japanned.....℔ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hemacite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbin, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60&10
Escutcheons and keys.....dis 60&10
Padlocks and padlock keys.....dis 75
Bell pulls, mineral, porcelain and jet dis 60&10
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps, genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 70
Letter box plates, genuine bronze...dis 60&10
Barn door locks.....dis 33⅓
Bishop's Buckeye Sash Locks.....℔ gross $4.80

Plumbs and Leve s.

Standard list.....dis 70&10
Pocket levels.....dis 70&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@60
Pitcher spout, best makers dis 60&10@60&10&10
Pitcher spout, cheaper goods.....dis 70@70&5

Pokes, Animal.

Bishop's I. X. L.....℔ doz $6 00
Bishop's O K.....℔ doz $5 25
Bishop's Pioneer.....℔ doz $3 75
Bishop's American.....℔ doz $2 75

Rakes.

Cast steel.....dis 70
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher.....$10@¼...dis 10
Rifle razor.....dis $9 50 net

Rat Killers.

Schuyler's.....℔ gross $15 00

Scales.

Hatch, Counter, No. 171.....℔ doz $21 00
Hatch, Tea, No. 161.....℔ doz $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....℔ doz $18 dis 25

Squares.

Steel and iron, Nickel plated } dis 75&10@80
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

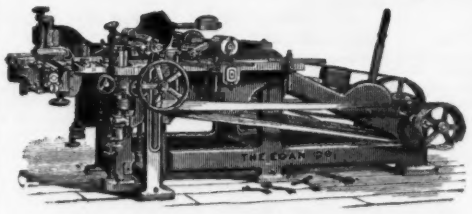
Tacks, Brads, Etc.

New List, Oct. 19, 1890.
American iron carpet tacks all kinds dis 77½&10
Steel carpet tacks all kinds.....dis 75&10
Swedes iron carpet tacks, all kinds dis 75&10
Swedes iron tacks.....dis 75&10
Swedes iron Upholsterers' tacks.....dis 75&10
Tinned Swedes iron tacks.....dis 77½&10
Tinned Swedes iron Upholsterers' tacks.....dis 77½&10
American iron cut tacks.....dis 77½&10
Copper tacks.....dis 40&10
Copper finishing and trunk nails.....dis 50&10
Cigar box nails.....dis 50&10
Finishing nails.....dis 60&10
Hungarian nails and miners' tacks...dis 60&10
Gimp and lace tacks.....dis 77½&10
" " " tinned.....dis 60&10
Trunk and clout nails.....dis 72½&10
Tinned trunk&clout nails.....dis 66&10
Basket nails.....dis 66&10
Chair nails.....dis 66&10
Common and patent brads.....dis 66&10

FREIGHT AND PASSENGER
ELEVATORS.
L. S. GRAVES & SON,
Main Office and Works, ROCHESTER, N. Y.
BRANCH OFFICES:
NEW YORK, 92 and 94 Liberty St.; BOSTON, 113 Devonshire St.; St. LOUIS, 301 Roe Building
DETROIT, Hodges Building.
SEND FOR CATALOGUE.

RUBBER GOODS
PACKING, BELTING, HOSE, GASKETS, ETC.
Fuller Bros.,
AGENTS
JEWELL LEATHER BELT, and REVERE RUBBER CO.
148 SUPERIOR STREET, CLEVELAND.

THE EGAN CO.,
Nos. 251 to 271 W. Front St., CINCINNATI, OHIO.
Builders and Originators, Designers and Constructors.
Wood-Working Machinery.



New "Standard Molder, Four Sided.
4, 6, 7, 8, 9, 10 and 12-inch.
Geared feed rolls, two above and two in table. Slotted steel heads.

For Every Purpose
Meeting the requirements of
PLANING MILLS,
SASH, DOOR and BLIND FACTORIES.
PATTERN SHOPS,
General Wood-workers etc.
With the latest and most advanced type of machines for fast and perfect work.
Send for Catalogue and information.

IRON CLAD PAINT CO.
Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.
CLEVELAND, OHIO.

Trade Mark Patented.
ORDER DIRECT FROM THE
Iron Clad Paint Co.
And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.
IRON CLAD PAINT is the most durable, most fire-proof and cheapest Paint made.
FURNISHED both Dry and Ground in Oil.
USED BY NEARLY ALL THE RAILROADS

AKRON CHEMICAL CO.,
Imperial Car and Bridge Paints.
PAINTS.
Black Asphaltum Paints. All grades.
150 State Street, AKRON, O.

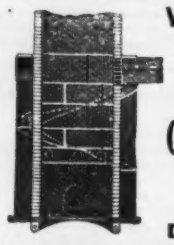
CATALOGUES
Printed in the Highest Style of Art, by
The Cleveland Printing & Publishing Co.,
Cleveland, O.

Classified List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks.

PAGE

Aluminum—
*Stan Aluminum Co., Canton, O. —
Automatic Sprinklers—
*Neracher Sprinkler Co., Warren, O. —
Alarms—
†Cuyahoga Mfg. Co., Cleveland. 11
Belting—
Fuller Bros., Cleveland. 15
Bolts and Bolt Machinery—
Upson Nut Co., Cleveland. 16
Boilers and Boiler Attachments—
Babcock & Wilcox Co., New York. 20
Wm. B. Pollock & Co., Youngstown, O. 18
E. H. Jones & Co., Cleveland. 18
Hazelton Tripod Boiler Co., Chicago. 18
N. Y. Central Iron Works, Geneva, N. Y. 16
Enterprise Boiler Co., Youngstown, O. 20
The Stirling Co., Barberton, O. 11
Blowers—
W. H. LaFountaine, Cleveland, O. 18
Bicycles—
*A. W. Gump & Co., Dayton, O. —
Boiler Solvents—
The Dearborn Drug & Chemical Co. 9
Coal and Coke—
Pittsburgh & Wheeling Coal Co., Cleveland. 13
Cranes and Derricks—
Wm. Tod & Co., Youngstown, O. 18
Chain Belting—
Jeffrey Mfg. Co., Columbus O. 14
Carpet Cleaning & Laundry Machines —
W. H. LaFountaine, Cleveland, O. 18
Civil Engineers and Architects—
F. Felkel, Cleveland, O. 16
Cupolas—
Victor Colliau, Detroit, Mich. 16
Corrugated Steel—
*Cincinnati Corrugating Co., Piqua, O. 12
Drilling Machines—
Universal Radial Drill Co., Cincinnati, O. 16
Drop Presses—
Toledo Tool & Machine Co., Toledo, O. 18
Desks—
Cleveland Desk Co., Cleveland. 13
Elevators—
L. S. Graves & Co., Rochester, N. Y. 15
Explosives—
Hercules Powder Co., Cleveland. 18
Electrical Manufactures—
†Cleveland Electrical Mfg. Co., Cleveland —
Central Thomson-Houston Co. 10
Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill. 20
Engravers and Electrotypers—
Eclipse Electrotype & Engraving Co., Cleveland. 17
Union Electrotype Foundry, Cleveland. 14
Engines (Steam)
*Chandler & Taylor Co., Indianapolis, Ind. —
Wm Tod & Co., Youngstown, O. 18
E. H. Jones & Co., Cleveland. 18
Buckeye Engine Co., Salem, O. 20
*Clough, Witt & Co., Cleveland. —
Skinner Engine Co., Erie, Pa. 19
Westinghouse Machine Co., Pittsburgh. 19
Ball & Wood Co., Elizabeth, N. J. 19
Southwark Foundry & Machine Co., Philadelphia, Pa. 19
*The Leffel Water Wheel & Engine Co. —
Geo. Place, New York. 12
Engines (Gas)—
Schleicher, Schumm & Co., Philadelphia, Pa. and Chicago, Ill. 18
Van Duzen Gas Engine Co., Cincinnati, O. 17
Engineers' Specialties—
Sensible Packing Co., Chicago, Ill. 11
Engineers and Contractors—
E. H. Jones & Co., Cleveland. 18
Ejectors—
James Jenks, Detroit, Mich. 12
Files, Makers of—
Reynolds Bros., Columbus, O. 20
A. & H. Gough, Cleveland. 12
Parkin & Bosworth Co., Cleveland. 20
Forges—
Cleveland City Forge & Iron Co., Cleveland 20
Foundries—
Thos. D. West. Foundry Co., Cleveland. 14
Canton Iron Foundry Co., Canton, O. 14
Furnace Feeders—
Brightman Stoker Co., Cleveland. 15
Galvanizers.
*H. H. Hodell, Cleveland. —
Gear Cutters—
Palmer, Cunningham & Co., Philadelphia, Pa. 14
Grapples, Excavators and Dredges—
Jas. H. Lancaster, New York. 17
Grey Iron Castings—
The Ohio Pulley Co., Warren, O. 20
Graphite Paint—
Jos. Dixon Crucible Co., Jersey City. 12
Granulated Raw Bone—
The Rogers & Hubbard Co., Middletown. 16
Heating and Ventilating Apparatus—
W. H. LaFountaine, Cleveland, O. 18
Hangers—
W. H. LaFountaine, Cleveland, O. 18
Heaters and Purifiers—
Stilwell & Bierce Manufacturing Co., Dayton, O. 20
E. H. Jones & Co., Cleveland. 18
*Warren Webster & Co., Philadelphia, Pa 20
Hammers (Pow r)—
Hackney Hammer Co., Cleveland. 16
Harness Specialties—
Buffalo Specialty Co., Buffalo, N. Y. 17
Investments—
W. N. G., Cleveland. 12
Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O. 19
Cambridge Iron Roofing Co., Cambridge, Ohio. 19
Garry Iron Roofing Co., Cleveland. 19
*Berger Mfg. Co., Canton, O. 19
Eberts Bros., Detroit, Mich. 20
Kanneberg Roofing Co., Canton, O. 19
*The Long Steel and Iron Roofing and Corrugating Co., Indinapolis. 19
J. H. Eller & Co., Canton, O. 19
W. J. Burton & Co., Detroit, Mich. 14
Holton Iron Roofing Co, New Lisbon, O. 19
Canton Steel Roofing Co., Canton, O. 13
‡Heberling Metal Roofing Co., Havana Ill. —
Iron Ore, Bar and Pig Iron—
Dalliba, Corrigan & Co., Cleveland. 13
Oglebay, Norton & Co., Cleveland. 13
J. H. Outhwaite & Co., Cleveland. 13
Condit-Fuller Co., Cleveland, O. 13
E. C. Pope, Cleveland. 13
Cleveland Iron Mining Co., Cleveland. 13
Injectors—
Penberthy Injector Co., Detroit, Mich. 20
*Garfield Injector Co., Wadsworth, O. 12
Lathes—
H. L Shepard, Cincinnati, O. 16
Parkin & Bosworth Co., Cleveland. 20
Lathe Dogs—
Palmer, Cunningham & Co., Philadelphia 14
Mining Machinery—
Webster, Camp & Lane Machine Co., Akron, O. 14
*Copeland & Bacon, New York. 12
Machine Shops—
Webster, Camp, & Lane Machine Co., Akron, O. 16
Toledo Machine & Tool Co., Toledo, O. 18
Machinists' Tools and Supplies—
Parkin & Bosworth, Co., Cleveland. 16 & 20
Garvin Machine Co., New York. 12
Metal Ceilings—
Fred F. Bischoff, Chicago, Ill. 16
Merchandise Brokers—
L. H. Oldfield, Wichita, Kan. 11
Ore Separators—
H. E. Collins & Co., Pittsburgh, Pa. 13
Patents—
*Munn & Co., New York. 11
Pumps (Steam)—
E. H. Jones & Co., Cleveland. 18
Deming Co., Salem, O. 17
Paint—
Iron Clad Paint Co., Cleveland, O. 15
Akron Chemical Co., Akron, O. 15
Jos. Dixon Crucible Co., Jersey City. 12
Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill. 12
Aitchison Perforated Metal Co., Chicago. 12
Pulleys—
Ohio Pulley & Machine Co., Warren, O. 20
Pipe Cutting & Threading Machines—
*Wells Machine Works, Fostoria, O. 12
Packing—
Sensible Packing Co., Chicago, Ill. 11
Railroads—
Time Tables, Etc. 17
Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland. 20
Rock Breakers and Ore Crushers—
Jas. H. Lancaster, New York. 17
Rubber Goods—
Fuller Bros., Cleveland. 15
Rolls and Pinions—
Totten & Hogg Iron & Steel Foundry Co., Pittsburgh, Pa. 11
Saws—
Peter Gerlach & Co., Cleveland. 13
Shafting—
*Brightman Machine Co,, Cleveland. 11
Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn. 16
Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland. 16
F. A. Sackman, Cleveland, O. 14
Jas. Murdock Jr., Cincinnati, O. 16
Sheet Iron—
Cleveland Rolling Mill Co., Cleveland. 13, 16
Cambridge Iron & Steel Co., Cambridge, O 13
Steel Castings—
Chester Steel Casting Co., Philadelphia, Pa. 19
Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland. 13, 16
Sheet Steel—
Cambridge Iron & Steel Co., Cambridge, O 13
Stokers—
Brightman Stoker Co., Cleveland. 15
Steam and Hot Water Heaters—
Hazelton Tripod Boiler Co., Chicago. 18
Steel Laths—
Bostwick Steel Lath Co., Niles, O. 11
Twist Drills—
Cleveland Twist Drill Co., Cleveland. 20
Graham Twist Drill Co., Detroit, Mich. 20
Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland. 20
Time Registers—
The Automatic Time Stamp and Register Co, Boston, Mass. 14
Water Gas Furnaces—
W. S. Hutchinson, Chicago, Ill. 20
Window Blinds—
Hartman Sliding Blind Co., Wooster, O. 16
Wood-Working Machinery—
*Indiana Machine Work, Ft. Wayne, Ind —
Geo. Place, New York, N. Y. 12
Frank & Co., Buffalo, N. Y. 18
The Egan Co., Cincinnati, O. 15
Wire Goods—
*F. Powell & Co., Toledo, O. —
Wire Machinery—
John Adt & Son, New Haven, Conn. 20
Well Sinking Machinery—
American Well Works, Aurora, Ill. 16
Washers—
Milton Mfg. Co., Milton, Pa. 12



VICTOR COLLIAU,
Sole Manufacturer of the
Improved Patent HOT BLAST COLLIAU CUPOLA
ADDRESS:
287 Jefferson Ave.,
DETROIT - MICH.

TRADE MARK.

The Dunnning Boiler.
OLDEST AND BEST FOR
STEAM and HOT WATER HEATING.
Over 16,000 in use. Also Steam Engines and Boilers of all kinds and Machinery generally. Manufactured at the
N. Y. CENTRAL IRON WORKS.
80 EXCHANGE ST.,
GENEVA, N. Y.

SHEPARD'S NEW $60
SCREW CUTTING
Foot Lathe
Cap Lathes, $1.25

Foot & Power Lathes, Drill Presses, Scroll-Saw Attachm'ts, Mandrels, Chucks, Twist Drills, Dogs, Calipers etc. Lathes on trial. Lathes on payment
Send for catalogue of Outfits for Amateurs or Artisans. Address H L. SHEPARD, Agt., 124 East Second St., Cincinnati, O.

J. M. ALLEN, President.
WM. B. FRANKLIN, Vice-President.
F. B. ALLEN, Second Vice-President.
J. B. PIERCE, Secretary and Treasurer.

A. S. FERRY, Gen'l Agt., 208 Superior Street, Cleveland, O.
C. A. BURWELL, Chief Inspector, 208 Superior St., Cleveland, O.
R. D. BRIGGS, Special Agt., 208 Superior St., Cleveland, O.
J. E. WOLCOTT Special Agent, 208 Superior St., Cleveland, O.
L. C. BURWELL, Special Agent, 81 4th Ave., Pittsburgh, Pa.

FOR SALE CHEAP.

One 80 h. p. Engine, one year in use.
One 50 h. p. Engine, one year in use.
One Duplex Pump, one year in use.
One Water Heater, one year in use.
One Crane Elevator,
One Donkey Engine,
One Cupola, 16 ton capacity.
One Delivery Wagon,
200 good Stove Plate Flasks and Snap Flasks.
—THE—
Mc ARTHUR GILMORE FOUNDRY CO.,
871 Pearl St., 568 Clark Ave.,
CLEVELAND, O.

GRANULATED RAW BONE
For Case-hardening and Coloring.
For samples, prices, etc., apply to
THE ROGERS & HUBBARD CO., Middletown, Ct.

CLEVELAND BUSINESS DIRECTORY.

F. FELKEL,
CIVIL ENGINEER AND ARCHITECT,
155 ST. CLAIR ST., CLEVELAND, O.
IRON BUILDINGS, LARGE SPAN ROOFS.
PLANS for Manufacturing Plants, Warehouses and other Heavy Structures a SPECIALTY.

Bolt and Nut Works.

THE UPSON NUT CO, Manufacturers of Nuts, Washers, Carriage, Machine, Plow and Elevator Bolts, Coach Screws, etc.

Hardware and Iron.

CLEVELAND ROLLING MILL CO., manufacturers of Steel and Iron Wire and Steel Tire.

Machinists' Supplies.

PARKIN & BOSWORTH, 9 and 11 So. Water St., dealers in Manufacturers' Supplies, Machinery and Tools.

Steel Stamps and Stencils.

FLEHARTY, J. H. & CO., Rubber Stamps, Seals, Stencils, Automatic Check Punches and Numbering Machines. 92 Seneca St.

BUSINESS DIRECTORY.

Akron, O.

WEBSTER, CAMP & LANE MACHINE CO., Founders and Machinists, 12 Main st.

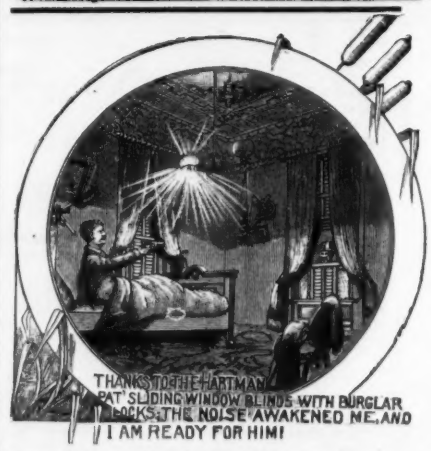
Bischoff Metal Ceilings,
(PATENTED.)

It will pay to investigate and write for catalogue.
Estimates submitted on application.
Fred. F. Bischoff & Co.
24 W. Lake St,
CHICAGO, - ILL.

Works and General Office AURORA.
LIGHTNING WELL-SINKING MACHINERY MANUFACTURERS.
Hyrdaulic, Jetting, Revolving, Artesian, Diamond Prospecting Tools, Engines, Boilers, Wind Mills, Pumps. Encyclopedia, 1,000 engravings, Earth's Strata, Determination quality water; mailed, 25c.
The American Well Works, Aurora, Ill.
Branches: 11 & 13 S. Canal St., Chicago, Ill.
Dallas, Texas.

JAS. MURDOCK, JR,
Manufacturer of
STEEL STAMPS,
NAME PLATES,
& TIMES &
& TOOL ROOM
CHECKS.
NILES TOOL WORKS 25
52 Longworth St, Cincinnati, O.

UNIVERSAL RADIAL RADIAL DRILLING MACHINES
THREE DESIGNS, SIX SIZES
EMBODY ALL DESIRABLE FEATURES
PRICES $450.00 & UPWARD
ADDRESS UNIVERSAL RADIAL DRILL CO
CINCINNATI, O. U.S.A.

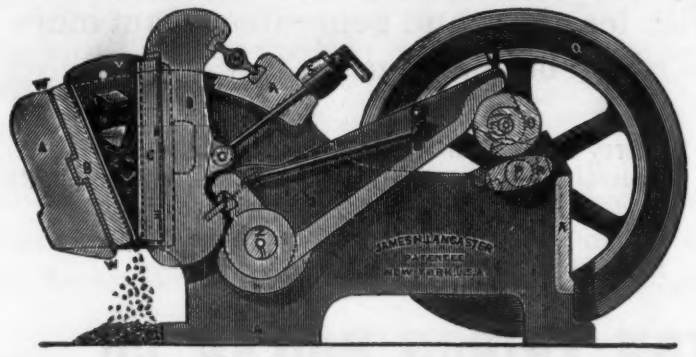


Tens of thousands of these blinds are in use. Agents wanted; send 4-cent stamp for an 80-page illustrated catalogue to
HARTMAN SLIDING BLIND CO.,
59 Beaver St., WOOSTER O., U. S. A

FOR
ARTISTIC
PRINTING
WRITE
CLEVELAND
PRINTING &
PUBLISHING CO.,
CLEVELAND, O.

The "Lancaster" Rock Breaker and Ore Crusher

The Strongest, Simplest, Cheapest and the Most Perfect Crusher Made.



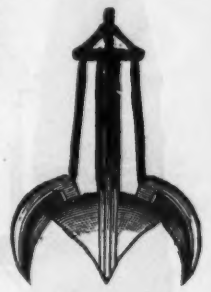
Instantly adjustable to yield any desired uniform grades of product.

Half the power only required and is less liable to breakage, and less in first cost and also in subsequent wear and tear, and less weight than any rival's breaker. For crushing rock for macadamizing and concreting purposes, and also for reducing ores, these breakers are specially efficient.

The "Lancaster" Crushers are also made in "Sections" for easy transportation in mountainous regions. May be mounted on wheels, worked by hand, horse gear and steam or other power, and also fitted with Rotary Screens, Elevators and Conveyors. Correspondence and trial tests solicited.

THE "LANCASTER"

Will automatically dig, raise and discharge mud, clay, gravel, sand, hard pan ores, rock phosphates and fire-clay from their beds and banks, and also load and unload vessels or barges with sand, coal, ores, grain and other materials. These Grapples are made of best forged steel, with four penetrating scoops, operated solely by compound leverage, thus dispensing with the inside sheaves, drums, catches, gears, chains and friction, found in all rival buckets. They may be worked by the "Lancaster" hand or horse-power, hoisters, or by any maker's double drum hoisting engines.



Send for our new illustrated price list, agency terms and testimonials, and make appointment to see our Rock Breakers, Grapples, Hand, Horse and Steam Power Hoisters at work. Comparison of our prices, capacities and merits with all rival Grapples, Rock Breakers, Hoisters, etc., earnestly solicited.

Self-Penetrating Grapple, Excavator and Dredger.

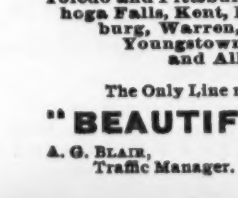
Correspondence solicited. Manufactured and sold by the patentee.

THE CONLEY-LANCASTER" DIRECT STEEL PROCESS.

JAMES H. LANCASTER. (P. O. BOX 3139) 169 AND 172 BROADWAY. NEW YORK, U. S. A.

GAS and GASOLINE ENGINES

STATIONARY and PORTABLE. All Sizes.



Dwarfs in Size, but Giants in Strength.

Expense one cent an hour per horse power and requires but little attention to run them.

Every Engine Guaranteed. Full particulars free by mail Mention this paper.

VAN DUZEN

GAS & GASOLINE ENGINE CO. Cincinnati, O.

Just Drive 'Em In and CLINCH 'Em.

THAT IS ALL YOU HAVE TO DO WITH

RAPID

HARNESS MENDERS.

THEY WILL MEND ANY STRAP

OR

HARNESS.

BETTER THAN IF SEWED, TWICE AS QUICK, AND COSTS LESS THAN HALF A CENT.

THIS CUT SHOWS THE WAY IT IS DONE.

They are put up in nice tin boxes containing three sizes one gross in each package. If you break down anywhere you can easily and quickly repair your HARNESS yourself.

COST ONLY 25c PER BOX. FOR SALE BY GROCERS AND HARDWARE DEALERS OR SEND TO THE MANUFACTURERS.

NO TOOLS REQUIRED.

Buffalo Specialty Mfg. Co.,

BUFFALO, N. Y.

Wheeling & Lake Erie Railway.

THE NEW THROUGH LINE

BETWEEN

TOLEDO

—AND—

Steubenville, Pittsburgh, Marietta.

THROUGH COACHES

BETWEEN

Toledo & Marietta.

Through Sleepers Between

PITTSBURGH AND CHICAGO.

AND DAY COACHES BETWEEN

Toledo and Pittsburgh, Via Akron, Cuyhoga Falls, Kent, Ravenna, Leavittsburg, Warren, Niles, Girard, Youngstown, New Castle and Allegheny.

The Only Line running through

"BEAUTIFUL ZOAR."

A. G. BLAIR, Traffic Manager. JAS. M. HALL, Gen'l Pass. Agent.

TRAVELERS' REGISTER.

Standard Time.

Erie Railway.

Depot, South Water Street and Viaduct.

	Arrive.	Depart.
N. Y. & Pitts. Express.....	‡5 38 a m	*8 25 a m
Fast N. Y. & Pitts. Express*	10 55 a m	*3 00 p m
Mahoning Accommo.....		†6 40 a m
Pittsburgh Express.....	†6 25 p m	
Youngstown Local.....	†8 05 a m	
Mahon'g div. & Pitts Local		*11 40 a m
Mahoning Val. Accom.....		†4 30 p m
Pittsburgh Express.....	‡1 20 p m	11 10 p m
New York Express.....	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

(Standard Gauge.)

Depart for—

Zanesville and Coshocton—6:50 a. m., 3:00 p. m.
Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.

Arrive from—

Zanesville and Coshocton—10:30 a. m.,6:30 p m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m., 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p. m., 7:10 p. m.
Trains marked * run daily.

Valley Railway.

FOR AKRON, CANTON AND MARIETTA.

Depot oot South Water Street.

	Depart.	Arrive.
Valley Junction Mail.....	*7 25 a m	*6 40 p m
Marietta Express.....	†11 15 a m	†2 35 p m
Balto. & Wash. Express....	*4 00 p m	*10 25 a m
Cleve. and Canton Express	†6 30 p m	†8 15 a m

*Daily. †Daily, except Sunday.

J. T. JOHNSON, Gen. Supt. J. B. CAVEN, Gen. Pass. Agt.

From Cleveland Union Station.

PENNSYLVANIA LINES.

Cleveland & Pittsburgh R. R.

	Arrive.	Depart.
For Pittsburgh, Baltimore, Washington, Philadelphia and New York.	d5 25 a m	7 45 a m
	d11 40 a m	d1 40 p m
	6 35 p m	d11 10 p m
	12 30 p m	7 45 a m
Wellsville, Wheeling and Bellaire.	6 35 p m	1 05 p m
	.....	*11 10 p m
Alliance Accom.....	10 10 a m	3 25 p m
Ravenna Accom.....	8 25 a m	5 00 p m

d Daily. *Excent Saturday Other trains except Sunday. Through Pullman Sleepers to New York on 1:40 p. m. train daily.

From Cleveland Union Station.

Mt Vernon and Pan Handle Route

Cleveland & Pittsburgh R. R.

	Arrive.	Depart.
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon, Columbus, Xenia, Dayton, Cincinnati, Louisville, Indianapolis, St. Louis, and all points in the South and Southwest	d 7 00 am	8 00 a m
	5 40 p m	d 8 00 p m
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon and Columbus.	12 30 p m	1 05 p m
For Cuyahoga Falls, Akron, Orrville, Chicago, and all points in the West and Northwest.	5 40 p m	8 00 a m
	10 10 a m	3 25 p m

d Daily. Other trains except Sunday.

Pullman Palace Sleeping Cars daily between Cleveland, Columbus and Cincinnati. City ticket office, Weddell House corner.

FT. WAYNE, CINCINNATI & LOUISVILLE RAILROAD.

The Popular Route Between the

NORTH and SOUTH

The Direct Route to or from

Fort Wayne, Indianapolis, Terre Haute, Evansville and St. Louis.

13 MILES SHORTER BETWEEN 13

Fort Wayne and Indianapolis,

Than any other Route.

22 MILES SHORTER AND QUICKER 22

BY THREE HOURS, BETWEEN

Louisville and Fort Wayne.

ASK FOR TICKETS VIA

Ft. Wayne, Cincinnati & Louisville R. R.

For sale by all Agents of connecting lines, East, West, North and South.

GEO. W. SAUL, Gen'l Supt. W. H. FISHER, Gen'l Pass. & Tk. Agt.

FORT WAYNE, IND.

PITTSBURGH AND LAKE ERIE RAILROAD.

"Cleveland & Pittsburgh Short Line."

Twenty (20) Miles Shorter than any other route between Cleveland, Pittsburgh, Washington, Baltimore and the South East.

5 Through Trains Daily 5

FAST TIME. NO DELAYS.

"For scenery picturesque and varied,
Through valleys green, 'mong mountains ser- [ried,
The people's favorite route I ween,
The P. & L. E. sits enthroned as queen."

See that your tickets read via

THE PEOPLE'S FAVORITE ROUTE.

E. HOLBROOK, Gen'l Supt., A. E. CLARK, G. P. & T. A.

Pittsburgh, Pa.

SCIOTO VALLEY RAILWAY.

Direct route, Columbus, O., to Circleville, Chillicothe, Waverly, Portsmouth, Ironton and Ashland, Ky. Three trains daily except Sunday. Favorite route, North and West, making close connection at Ashland, Ky., with the Chesapeake & Ohio Ry., through the canons of New River, passing White Sulphur Springs and the many Summer resorts of the Alleghenies in Virginia.

Shortest and Quickest Route to Richmond, Lynchburg, Newport News, Old Point Comfort.

J. ROBINSON, Receiver, Columbus, O. JNO. J. ARCHER, Gen'l Pass. Agt

—THE—

Cleveland & Marietta Ry.

THROUGH TRAINS

BETWEEN

Toledo, Cleveland and the Ohio River.

The shortest and best Route via Marietta to

Washington, D. C., Charleston, W. Va., Parkersburg, W. Va., and the South.

Direct connections at Union Depots, with all great through lines to all Points

WEST, NORTHWEST, SOUTH, SOUTHWEST AND SOUTHEAST.

Lowest Rates. Quickest Time. Best Accommodations.

Tickets sold and baggage checked through to destination. Reliable information and best rates will be furnished by any agent of the Popular C. M.

A. T. WIKOFF, Pres. and Gen. Mgr. W. K. RICHARDS, G. P. & T. A.

THE FAVORITE

—AND—

PICTURESQUE ROUTE

—TO—

New York, Boston and the East.

The shortest and quickest Route to Pittsburgh, Washington and Baltimore & the Southeast.

New Central Depot So. Water St. and Viaduct

	Depart.
No. 62, Accommodation.....	† 6 00 a m
No. 72, New York & Pitts. Express....	* 8 10 a m
No. 70, Pittsburgh Accom.....	*11 25 a m
No. 64, New York & Pitts. Limited...	* 2 50 p m
No. 66, Mantua Accommo.....	* 4 20 p m
No. 74, Youngst'n Ex.....	† 6 00 p m
No. 68, New York & Pitts. Ex.....	*11 00 p m
	Arrive.
No. 61, N. Y. & Pittsburgh Express...	† 5 15 a m
No. 71, Youngstown Accom.....	* 7 15 a m
No. 65, New York & Pitts. Lim.....	* 9 55 a m
No. 67, Pittsburgh Accom.....	*12 30 p m
No. 73, Leavittsburgh Local.....	* 2 10 p m
No. 63, New York & Pitts. Ex.....	* 6 50 p m
No, 75, Mantua Accom.....	* 7 20 p m
No. 69, Youngstown Express.....	† 9 10 p m

*Daily. †Daily, except Sunday.

Baggage checked through to all points East.

Through tickets and information regarding the route can be obtained at office, 141 Superior street, and at Depot N. Y., P. & O. Railroad, South Water street and Viaduct, Cleveland.

A. M. TUCKER, Gen. Mang., Cleveland, O.
W. C RINEARSON, Gen. Pass. Ag't, New York.
G. E. FOUTS, C P. & T. A., Cleveland.

ECLIPSE ELECTROTYPE ENGRAVING CO. AUST & CLARK PROPRIETOR CLEVELAND

THE HAZELTON TRIPOD BOILER

Furnishes more and dryer steam with less fuel, and generates steam more rapidly, than any other boiler in use.

CLEVELAND REFERENCES.

J. W. Britton, Esq..
Woods, Jenks & Co.,
W. S. Tyler Wire Works Co.,
Cleveland Forge & Iron Co.,
Bishop & Babcock Co.,
Cleveland Saw Mill & Lumber Co.

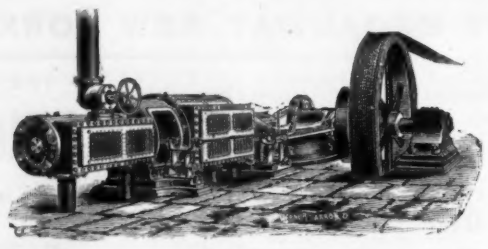
Cherry Valley Iron Works, Leetonia, O.,
Federal St. & Pleasant Valley Pass. Ry., Pittsburgh, Pa.,
Anglo-American Provision Co., Chicago,
Wellsville Plate & Sheet Iron Co., Wellsville, O.,
Falcon Iron & Nail Co., Niles, O.

Address: THE HAZELTON TRIPOD BOILER CO.,

GEO. A. HUMPHREYS, Ag't, 723 Perry-Payne Bldg., CLEVELAND, O. 809 Monon Block, 324 Dearborn St., CHICAGO, ILL.

Who also offer the Hazelton Purifier which we guarantee will remove 90 to 95 per cent. of the impurities from feed-water.

WILLIAM TOD & CO., YOUNGSTOWN, OHIO.



The Porter Hamilton Engine.

Single Compound and Condensing-100 horse-power and upwards.

THE HAMILTON BLOWING EFGINE, HYDRAULIC CRANES, ACCCUMULATORS AND SHEARS.

HEAVY SPECIAL MACHINERY GENERALLY.

SEND FOR ILLUSTRATED CATALOGUE.

THE DEMING CO.,
SALEM, OHIO.

Pumps,

For HAND AND POWER.

Adapted for BOILER FEEDING, FIRE PURPOSES, etc.; also ARTESIAN WELL CYLINDERS and WORKING HEADS for FACTORIES, MILLS and FURNACES.

HENION & HUBBELL, 55 & 57 N. Clinton St., Chicago, General Western Agents

Send for illustrated catalogue and price list. Mention this paper.

BOILERS — MAHONING BOILER WORKS — PIPES, STACKS, BEAMS, ROOF TRUSSES, BLAST FURNACES & ROLLING MILL WORK.
WM. B. POLLOCK & CO. YOUNGSTOWN, O.

E. H. JONES & CO.,

ENGINEERS AND CONTRACTORS,

223-225 River St., CLEVELAND, O.

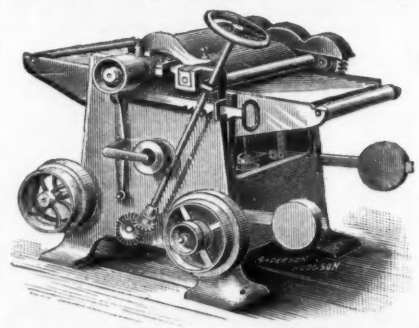
Steam Plants Complete. Engines, Boilers, Pumps, Heaters, Etc.
Steam and Hot Water Heating.

STURTEVANT'S BLOWERS, COILS, ETC.,
FOR HOT BLAST HEATING.

FRANK & CO., BUFFALO, N. Y.

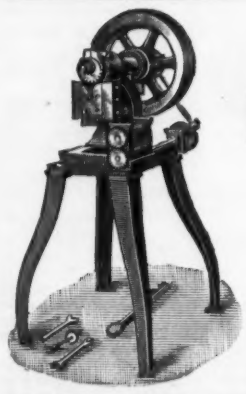
MANUFACTURERS OF

Band Saws, Scroll Saws, Universal Saw Benches,



Saw Mandrels, Pony Planers,
Matchers, Friezing Machines,
Shafting, Pulleys, Hangers,
Couplings, Wood Turning and
Pattern Makers' Lathes.

WOOD WORKING MACHINERY.



THE TOLEDO MACHINE TOOL CO.,

MANUFACTURERS OF

PRESSES, DROP PRESSES, DIES,

AND

Special Machinery

DESIGNED AND BUILT TO ORDER.

Dies for all kinds of sheet metal goods, leather, paper, etc. Inventors' models and specialties. Send for circulars and prices.

St. Clair and Washington Streets.

Mention this paper. TOLEDO, O

HERCULES POWDER

SEND FOR DESCRIPTIVE PAMPHLET.

Stump before a blast. | Fragments after a blast.

STRONGEST and SAFEST EXPLOSIVE
Known to the Arts.

POWDER, FUSE, CAPS,
Electric Mining Goods,

AND ALL TOOLS FOR STUMP BLASTING,
FOR SALE BY THE
HERCULES POWDER COMPANY,
40 Prospect Street, Cleveland, Ohio.
J. W. WILLARD, Manager.

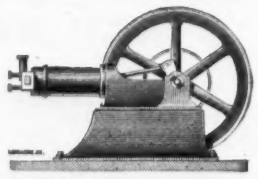
HERCULES,
THE GREAT STUMP AND ROCK
ANNIHILATOR.

Otto Gas Engine Works,

SCHLEICHER, SCHUMM & CO., { Philadelphia, Chicago.

Horizontal OTTO Gas Engines.
Vertical OTTO Gas Engines.
Twin Cylinder OTTO Gas Engines.
Combined OTTO Gas Engine Pumps.
Combined OTTO Gas Engine Dynamos.

SIZES: 1, 2, 4, 7, 10, 15, 25 AND 50 HORSE-POWER.



W. H. LaFountaine,

MANUFACTURER OF

VENTILATING FANS AND BLOWERS, HANGERS,

Carpet Cleaning and Laundry Machinery and other Special Machinery.

1335 Lexington Ave., - CLEVELAND, O.

THE BALL & WOOD CO.,

Owners of Ball Patents and Builders of

Improved Automatic Cut-off Engines.

Under the personal supervision of the inventor, F. H. Ball.

Simple Engines, **Electric Lighting Plants,**
Compound Engines, for **Electric Railway Plants,**
Triple Expansion Engines, **Manufacturing Engines,**

And all purposes requiring close regulation and economy.

WORKS, ELIZABETH, N. J. **OFFICE, 15 CORTLANDT ST., N. Y.**

The Long Steel & Iron Roofing & Corrugating Co.,

(Successors to O. S. KEELY & CO.) Manufacturers of

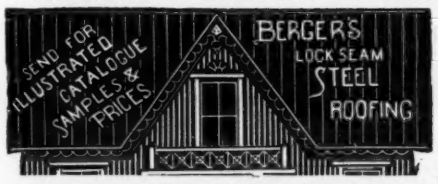
STEEL AND IRON ROOFING,

Corrugated Siding and Ceiling, Iron Ore Paint, Cement, Etc.

N. E. Cor. Illinois and Merrill Streets, IND'ANAPOLIS, IND

Write for Catalogue and Price List.

The BERGER MANUFACTURING COMPANY, CANTON, O.



DON'T make arrangements for ROOFING until you have seen ours.

It Excels all other Metal Roofs.

WESTINGHOUSE ENGINES

USED BY THE FOLLOWING GOVERNMENTS:

UNITED STATES.

U. S. Torpedo Station, Newport, R. I., 43 H. P.
U. S. Army Department, San Antonio, Tex., 50 H. P.
U. S. Engineer Corps, St. Louis, Mo., 8 H. P.
U. S. Military Post, Fort Canby, Wash., 4 H. P.
U. S. Government Quartermaster Department, Vancouver, Wash., 62 H.P.
U. S. Government Quartermaster Department, New Orleans, La., 15 H. P.
U. S. Senate, Washington, D. C., 150 H. P.
U. S. House of Representatives, Washington, D. C., 75 H. P.
U. S. Government Ice Factory, San Antonio, Tex., 4 H. P.
U. S. Navy Yard, Norfolk, Va., 125 H. P.
U. S. Navy Yard, Brooklyn, N. Y., 125 H. P.
U. S. Government, Ellis Island, N. Y., 120 H. P.
U. S. Dispatch Boat "Lucerne," Norfolk, Va., 50 H. P.
Washington Monument, Washington, D. C., 25 H. P.
MEXICAN: State of Guerrero, 15 H. P.
JAPANESE: In Government Coal Mines, 150 H. P.
HOLLAND: Government Physical Laboratory of Leiden, 15 H. P.
RUSSIAN: Moscow Imperial Technical School, 10 H. P.
NEW SOUTH WALES: Government of New South Wales, 160 H. P.
TASMANIAN: Alexandria Battery, Hobart, 75 H. P.
ENGLISH: Number unknown. Details not reported. Over 30 engines.

Many others sold by agents, but not reported.

THE WESTINGHOUSE MACHINE COMPANY.
BARTLETT & CLEVE. **PITTSBURGH, PENNA. U.S. OF A.**

SKINNER ENGINE CO., ERIE, PA.

OVER **4500** IN USE.

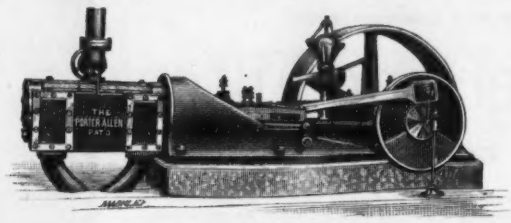
MANUFACTURERS OF

AUTOMATIC, STATIONARY & PORTABLE

ENGINES and BOILERS

SEND FOR CATALOGUE.

SOUTHWARK FOUNDRY & MACHINE CO., Philadelphia, Pa.

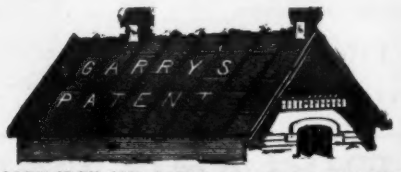


SOLE MAKERS OF THE

PORTER-ALLEN AUTOMATIC ENGINE.

ALSO BUILDERS OF

Blowing Engines, **Reversing Engines,** **Hydraulic Cranes,**
Centrifugal Pumps, **Accumulators,** **Boilers Tanks, etc.**



GARRY IRON AND STEEL ROOFING COMPANY,

The Largest Manufacturers of Iron and Steel Roofing in the World,

MANUFACTURERS OF ALL KINDS OF

Iron and Steel Roofing, Crimped and Corrugated Siding, Iron and Steel Tile or Shingle, Fire-Proof Doors and Shutters, Iron Ore Paint and Cement.

Iron Frames for Roofs and Buildings.

No. 152 MERWIN ST., CLEVELAND, O.

Send for Circular and Price List No. A

THE KANNEBERG ROOFING CO., Canton, O.

The Originators of Strictly Genuine Steel Roofing.)

MANUFACTURERS OF THE

Kanneberg Pat., Latest Improved, Folded Lock Seam Roofing,

Made of STRICTLY GENUINE STEEL.

CORRUGATED IRON (four sizes of corrugations), and Crimped Edge Iron Roofing and Siding, Beaded Iron Siding and Ceiling, Water Proof Building Paper, Dry and Ready Mixed Paints, Etc

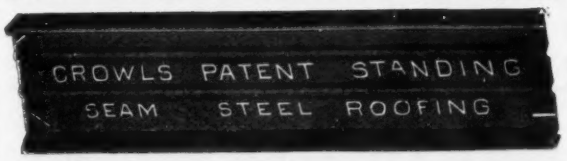
Write for Catalogues, Price Lists and Samples.

HOLTON ROOFING, IRON ROOFING SIDING, CEILING &C. C.

NEW LISBON, O.

AGENTS WANTED EVERYWHERE

CAMBRIDGE ROOFING CO., Cambridge, O. & Chatanooga, Tenn.



Manufacturers of

Plain, Rolled, Crimped Edge, Corrugated and Beaded Roofing, Siding and Ceiling.

PURE STEEL A SPECIALTY

Send for Descriptive Catalogue.

J. H. ELLER & CO.,

—MANUFACTURERS OF—

Steel Roofing,

Corrugated Iron,

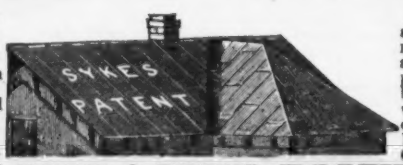
Crimped Edge Roofing and Siding, Beaded Siding and Ceiling, Patent Slip Joint EAVE TROUGHS, etc.

WRITE US FOR PRICES.

Agents Wanted. Address OFFICE NO. 223, CANTON, O

SYKES' IMPROVED

Best Roof in the World. Suitable for all classes of buildings. Easy put on.



All my Iron and Steel is re-rolled and box annealed, well painted on both sides with the Best of Paint and Pure Linseed Oil.

SYKES IRON & STEEL ROOFING CO.,

Send for Circular and Price List, and mention this paper

NILES, O., and CHICAGO, ILL.

STEEL CASTINGS

FROM 1-4 TO 15,000 LBS. WEIGHT.

True to pattern, sound, solid, free from blow-holes and of unequaled strength.

Stronger and more durable than iron forgings in any position, or for any service whatever.

60,000 CRANK SHAFTS and 50,000 GEAR WHEELS of this steel now running prove this.

Crossheads, Rockers, Piston-Heads, etc., for Locomotives. STEEL CASTINGS of every description.

Send for circulars and prices to

Chester Steel Castings Co.,

WORKS: CHESTER, PA. OFFICE: 407 LIBRARY ST., PHIADELPHIA, PA.

STILWELL'S

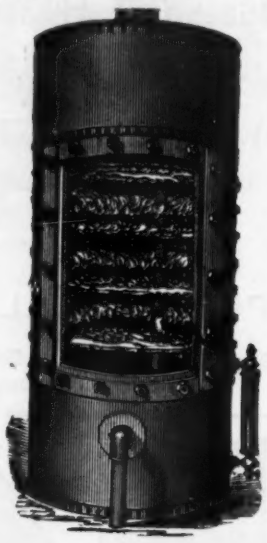
PATENT LIME-EXTRACTING

Heater and Filter

COMBINED,

Is the only lime-extracting Heater that will prevent scale in steam boilers, removing all impurities from the water before it enters the boiler. Thoroughly tested.

OVER 3,000 OF THEM IN DAILY USE.



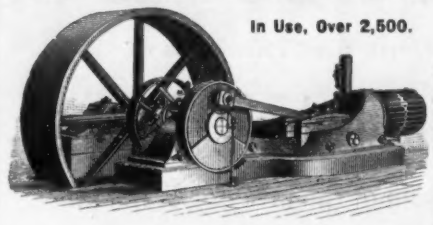
This cut is the fac simile of the appearance of the shelves o. a No. 5 Heater at work on ordinary lime-water when the door was removed after the Heater had been running two weeks.

ILLUSTRATED CATALOGUES.

Stilwell & Bierce Mfg. Co.,

DAYTON, OHIO.

NEW TANGYE BUCKEYE AUTOMATIC CUT-OFF ENGINES.



In Use, Over 2,500.

25 to 1,000 H. P.

These engines are the combined result of long experience with automatic cut-off regulation, and most careful revision of all details. They are designed and constructed for heavy and continuous duty at medium or high rotative speeds. Highest attainable Economy in Steam Consumption and Superior regulation guaranteed. **Self-contained Automatic Cut-off Engines 12 to 200 H. P. for driving Dynamo Machines a Specialty.** Illustrated Circulars, with various data as to practical Steam Engine Construction and performance, free by mail. Address **BUCKEYE ENGINE CO., Salem, O.**

SALES AGENTS:

W. L. SIMPSON, 10 Telephone Building, 18 Cortlandt St., N. Y.

W. N. ROBINSON, 154 Washington St., Chicago, Ill. ROBINSON & CARY CO., St. Paul, Minn.

Water Gas Furnaces

FOR LOCOMOTIVES, STEAMBOATS AND STATIONARY BOILERS.

A Perfect Smoke Burner.

W. S. HUTCHINSON. 6 Washington-st., Chicago.

OLD 1874. **CLEVELAND TWIST DRILL CO.,** RELIABLE 1891.

SEND FOR CATALOGUE. **Cor. Lake & Kirtland Sts., Cleveland, O.** WRITE FOR DISCOUNTS.

The Hart or Detroit

Emery Corundum Wheels and Machinery.

Write to J. WENDELL COLE, M. E.,

District Manager, Box 152, Chicago, Ill., or Box 84, Columbus, O.

N. B.—Also Agent for WM. SELLERS & CO.'S SPECIAL TOOL GRINDER and TWIST DRILL GRINDER WITH POINTER, for Pennsylvania, Ohio, Indiana, Illinois and Wisconsin.

PENBERTHY

AUTOMATIC INJECTOR.

Guaranteed 99 per cent. Efficiency

AS A BOILER FEEDER.

42,000 in actual use.

Sent on 30 days' trial.

PENBERTHY INJECTOR COMPANY.,

Manufacturers,

DETROIT, - MICH.

C. H. PRESLEY, Agent, Cleveland, O.

WE HAVE A NUMBER

Of Second-hand Tools in A-1-Condition consisting of

Planers, Lathes, etc.

Should this interest you, advise us and we will be pleased to quote you Prices. Address,

THE PARKIN & BOSWORTH CO., 6 S. Water St., CLEVELAND, O.

PRESSED WROUGHT IRON OPEN TURN BUCKLES.

BEST AND Cheapest.

The list retail price of this Buckle is less than one-half the wholesale price of inferior goods when we commenced to manufacture, and dealers, even in small towns, find it profitable to carry a stock to sell with iron for tie rods

CLEVELAND CITY FORGE & IRON CO., CLEVELAND, OHIO.

REYNOLDS BROS.,

MANUFACTURERS OF

Hand Cut Files

AND RASPS.

We solicit the commercial trade only.

133 & 135 N. Water St.,

COLUMBUS, OHIO.

Old Files Recut and Warranted Superior to any Machine Cut and Lead Tempered in the market. Send for price list.

INDUSTRY FILE WORKS,

A. & H. Gough, Props.,

Manufacturers of

Files and Rasps,

Equal to the Best English File.

OLD FILES RE-CUT.

All Kinds of Job Grinding.

OFFICE & WORKS,

48 COLUMBUS ST.,

CLEVELAND, O

C. GOUGH Manager.

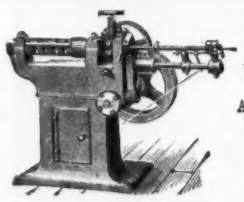
Mention this paper.

Awarded the GRAND PRIZE at the Paris Exhibition.

Cleveland Office, 412, Perry-Payne Building, Cleveland, O.

GRAHAM TWIST DRILL CO., Detroit, Mich.,

Sole manufacturers of **GRAHAM'S PATENT GROOVED SHANK TWIST DRILLS and CHUCKS.** Endorsed by progressive mechanics everywhere. Send for Catalogue.

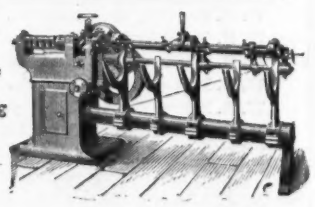


JOHN ADT & SON,

New Haven, Conn.

Builders of Machinery for Hardware Manufacture.

Automatic Wire Straightening and Cutting Machines, Butt Milling Machinery, Butt Drilling Machinery, Riveting Machines, Foot Presses, Sprue Cutters, Etc.



Enterprise Boiler Company, YOUNGSTOWN, OHIO.

MANUFACTURERS OF

BOILERS, AND TANKS, SHEET IRON AND PLATE WORK

Of all Descriptions.

Jobbers of all kinds of **Roofing Materials.**

W. H. EBERTS. ESTABLISHED 1871 J. M. EBERTS

EBERTS BROS,

MANUFACTURERS OF

CORRUGATED IRON ROOFING, SIDING & CEILING.

OFFICE AND WORKS 192 TO 198 HIGH ST. WEST

DETROIT, MICH.

PRESSED STANDING SEAM, V Crimped and Roll Cap **IRON ROOFING.**